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Draft OU2 Subsurface IM/RA  
Soil Vapor Extraction Pilot Unit  
Operations and Maintenance Manual

Manual  
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***The descriptions, methods and recommendations provided in the following sections are no replacement for COMMON SENSE. When the operator encounters a situation that appears extraordinary, SAFETY is the primary concern of the operator. The operator needs to assess each situation with safety as a primary concern. Plant performance becomes a secondary concern to the operator when and where the situation demands.***

\*\*\*\*\*

|                                                                                                                                |                                               |                                                                                         |
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## 1.0 INTRODUCTION

The Mobile Soil Vapor Extraction (SVE) Pilot Unit for the OU-2 Subsurface IM/IRA was designed and fabricated by Resource Technologies Group, Inc for EG&G Rocky Flats, Inc

The SVE Pilot Unit will be used in conjunction with a groundwater extraction wellfield to evaluate the effectiveness and economics of in-situ vapor extraction to remove volatile and semivolatile compounds from vadose zone soils. The success of the project will be determined as discussed in the Test Plan for the project. The vapors extracted by the SVE Pilot Unit will be treated by HEPA filtration and a granular activated carbon adsorption system prior to discharge to the atmosphere.

The system has been designed to produce 600 acfm at a maximum of 10 inches mercury vacuum through the use of a dual blower system. Actual expected vacuum conditions at the extraction wells will be less than this and will depend on desired flowrates, piping configuration, and subsurface soil conditions. It is anticipated that the actual extraction well vacuum levels will range from 5 to 8 inches mercury vacuum.

The soil gas will be pulled from the well(s) through a water separator to remove any entrained mist. The vapor then passes through a HEPA filter assembly consisting of a prefilter and HEPA filter for removal of any potential radionuclide particles. The air then passes through the first blower and is pushed/pulled through the two granular activated carbon columns. After exiting the carbon columns the air passes through the second blower and is discharged to the atmosphere. A third blower has also been provided as an air supply source for tests involving air injection.

This document provides operations and maintenance methods for all aspects of operations of the SVE Pilot Unit. This includes normal operations, maintenance requirements, and instrumentation calibration requirements. Control system programming documentation and manufacturers information for all major components are also provided.

|                                                                                                                               |                                               |                                                                                         |
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## 2.0 SITE PREPARATION

The SVE Pilot Unit must be located at a site in a manner to facilitate ease of assembly and operation. The procedure for site selection and preparation involves the following:

- 1 Select an area close to the well(s) to be evaluated. The trailer has been designed to provide a specific flow at a specified vacuum at the blower. Pressure drops realized by extremely long runs of piping cannot be overcome by the blowers so the trailer should be located as close to the well(s) as possible.
- 2 Select a level area of approximately 30 feet by 60 feet for assembly of the trailer and component pieces. A grade of 1 foot drop in 100 feet is acceptable, however, any steeper grades will require site preparation and grading. The site must be smooth to allow forklift operators to remove equipment requiring maintenance.
- 3 It is desirable to provide a site which directs drainage away from the trailer. This will help in the housekeeping inside the trailer.
- 4 Preparation for power should be provided prior to system set-up. A power supply of 200 amp, 120 kilowatts service at 460 volts 3 phase is needed. This can be provided either by a generator or from line power if available.
- 5 Four soil anchors are required for the tie-down of the trailer. Anchor installation details are provided on RTG Drawing 802. The screw anchors shall be embedded to a depth based on soil conditions to provide a pull-out force of 12.0 kips (service load) and tested to 18.0 kips pull-out force. The drill angle from the horizontal (ground) plane may deviate  $\pm 5^\circ$  from the specified angle of  $54^\circ$  on the drawings. The ground position of the soil anchors may deviate  $\pm 12"$  in a direction parallel to the trailer. The dimension perpendicular to the trailer, specified as 5'-6" from the lashing ring on the drawing, shall not change.

### 3.0 SET-UP

- 1 Unload all stairs, platforms, exterior air inlet piping with filters, piping vent, and flow control station piping and pipe supports
- 2 Spot trailer on a level site and adjust the independent landing gear to level the trailer
- 3 Tie trailer down to soil anchors described in Section 2 0, Site Preparation
- 4 Install platforms to trailer and attach the stairs to each platform
- 5 Remove shipping covers from the piping penetrations in the trailer walls and remove protection from the vacuum/pressure relief valve floor penetrations
- 6 Set up pipe support stands and install flow control station piping per the Drawings Install makeup air inlet filter
- 7 Connect the 460 volt 3 phase, 60Hz, 200 amp service to the fused disconnect located at the front of the trailer
- 8 Connect all feed, discharge and drain lines to the appropriate flanged connections per the Drawings
- 9 Connect all control wiring for remote signals from the following locations to the appropriate terminal strips in the junction boxes located on the front and side of the trailer per the Drawings
  - a Ground water storage tanks T-2201 and T-2202 level transmitters (LT-2201, LT-2202)
  - b Flow control station remote flow displays
  - c Flame ionization detector remote display
  - d Bubbler panel for bedrock well water level measurement
- 10 **CAUTION:** Check all rotating equipment at this time to ensure proper electrical connection and rotation

## 4.0 OPERATIONS

The SVE Pilot Unit includes the following primary unit operations and systems

- Extracted Vapor System
  - Vacuum Blowers
  - Flow Control Station for Extracted Vapor and Makeup Air
  - Inline Organic Vapor Concentration Monitoring
  - Knockout Drum
  - HEPA Filtration
  - Granular Activated Carbon
- Air Injection System
- Ground Water Removal and Storage System
- Gas Sampling System
- Trailer Auxiliary Systems

The following sections review the basic operating procedures for each of these systems

### 4.1 CONTROL SYSTEM DESCRIPTION

The control system consists of the following two primary components

- Graphic interface panel, and
- Programmable logic controller

Descriptions of each of these primary components are provided in the following sections

#### 4 1 1 Graphic Interface Panel

The graphic interface panel is a PanelMate Compact manufactured by Eaton IDT. The unit provides a black and white CRT display with pushbuttons located around the screen to allow the operator control of system operations.

Six pages of display information are programmed into the unit. These pages are titled as follows

- **Page 0 - Inlet Conditions,**
- **Page 1 - System Temperatures and Information,**
- **Page 2 - FID Information,**
- **Page 3 - Blower Control and Blower Discharge Data,**
- **Page 4 - Pump Control and Tank Levels,**
- **Page 5 - Well Information,**
- **Page 6 - Timers, and**
- **Page 7 - System Alarms and Setpoints**

Each page provides various displays of process variables including temperature, pressure, relative humidity, and flow. In addition, controls for rotating equipment and alarm setpoint menus are provided.

Detailed documentation on the graphic interface panel programming may be found in Appendix B 1. The following sections provide details on specific displays and controls associated with each page.

### Page 0 - Inlet Conditions

This page contains a display of the measured inlet conditions for the extracted vapor from the wells and makeup air. A representation of this screen is provided on Figure 1. Specific displays and controls include the following:

| Identification | Units     | Description                       |
|----------------|-----------|-----------------------------------|
| PI-110         | in HG vac | Extracted vapor pressure          |
| FI-110         | SCFM      | Extracted vapor flowrate          |
| FQ-110         | 1000 SCFM | Extracted vapor total flow        |
| MI-110         | % RH      | Extracted vapor relative humidity |
| TI-110         | deg F     | Extracted vapor temperature       |
| PI-100         | in HG vac | Makeup air pressure               |
| FI-100         | SCFM      | Makeup air flowrate               |
| FQ-100         | 1000 SCFM | Makeup air total flow             |
| MI-100         | % RH      | Makeup air relative humidity      |
| TI-100         | deg F     | Makeup air temperature            |

### Page 1 - System Temperatures and Information

This screen displays remaining system temperatures, pressures and relative humidities excluding those directly associated with the blowers. A representation of this screen is provided on Figure 2. Specific displays and controls include the following:

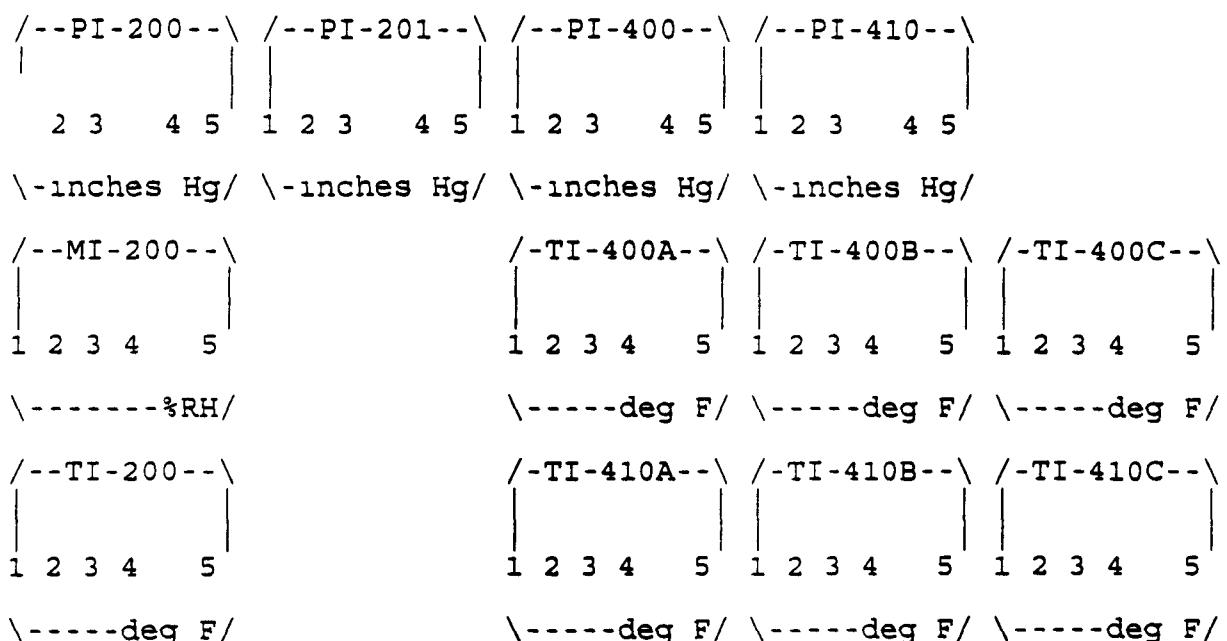
**FIGURE 1**

PAGE 0 Inlet Conditions

/--PI-100--\ /--FI-100--\ /--FQ-100--\ /--MI-100--\ /--TI-100--\  
1 2 3 4 5 1 2 3 4 5 6 1 2 3 4 5 6 1 2 3 4 5 1 2 3 4 5  
. -inches Hg/ \-----SCFM/ \>-1000 SCF/ \-----%RH/ \-----deg F/  
/--PI-110--\ /--FI-110--\ /--FQ-110--\ /--MI-110--\ /--TI-110--\  
1 2 3 4 5 1 2 3 4 5 6 1 2.3 4 5 6 1 2 3 4 5 1 2 3 4 5  
\-inches Hg/ \-----SCFM/ \>-1000 SCF/ \-----%RH/ \-----deg F/

## FIGURE 2

PAGE 1 System Temperatures & Information



| Identification | Units     | Description                                                                           |
|----------------|-----------|---------------------------------------------------------------------------------------|
| PI-200         | in HG vac | Knockout drum outlet pressure<br>HEPA filter inlet pressure                           |
| PI-201         | in HG vac | HEPA filter outlet pressure<br>Blower B-300 inlet pressure                            |
| PI-400         | in HG vac | Activated carbon column 1 outlet pressure<br>Activated carbon column 2 inlet pressure |
| PI-410         | in HG vac | Activated carbon column 2 outlet pressure<br>Blower B-500 inlet pressure              |
| MI-200         | % RH      | Knockout drum outlet relative humidity<br>HEPA filter inlet humidity                  |
| TI-200         | deg F     | Knockout drum outlet temperature<br>HEPA filter inlet temperature                     |
| TI-400A        | deg F     | Carbon column T-400<br>2 foot bed depth temperature                                   |
| TI-400B        | deg F     | Carbon column T-400<br>4 foot bed depth temperature                                   |
| TI-400C        | deg F     | Carbon column T-400<br>6 foot bed depth temperature                                   |
| TI-410A        | deg F     | Carbon column T-410<br>2 foot bed depth temperature                                   |
| TI-410B        | deg. F    | Carbon column T-410<br>4 foot bed depth temperature                                   |
| TI-400C        | deg F     | Carbon column T-410<br>6 foot bed depth temperature                                   |

## Page 2 - FID Information

This page presents control of the FID setpoints, and display of organic compound concentrations. A representation of this screen is provided on Figure 3. Specific displays and controls include the following:

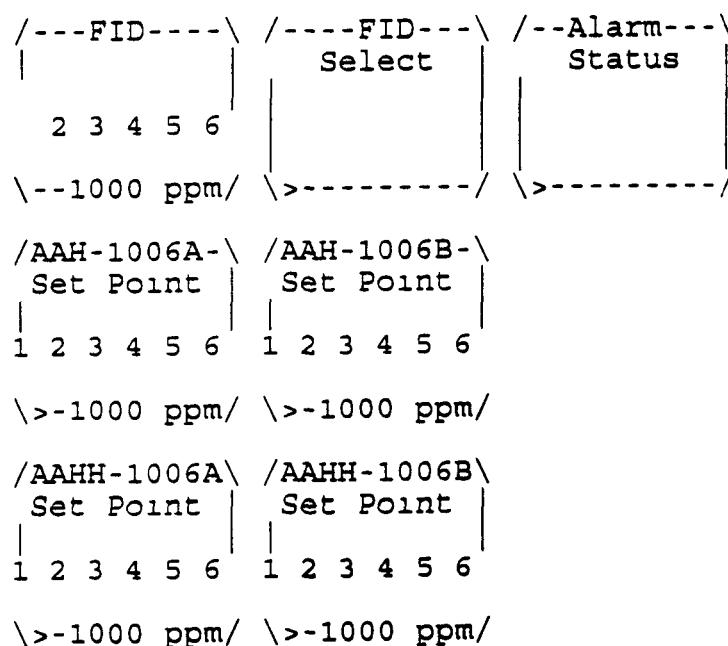
| Identification      | Units    | Description                                                                                        |
|---------------------|----------|----------------------------------------------------------------------------------------------------|
| FID Display         | 1000 ppm | Organic compound concentration                                                                     |
| FID SELECT          | N/A      | Selector for extracted vapor or activated carbon feed setpoints                                    |
| Alarm Status        | N/A      | Indicates HIGH or HIGH-HIGH alarm and provides system reset to allow restart after HIGH-HIGH alarm |
| AAH-1006A Setpoint  | 1000 ppm | Extracted vapor HIGH organic vapor concentration setpoint                                          |
| AAH-1006B Setpoint  | 1000 ppm | Extracted vapor HIGH-HIGH organic vapor concentration setpoint                                     |
| AAHH-1006A Setpoint | 1000 ppm | Activated carbon HIGH organic vapor concentration setpoint                                         |
| AAHH-1006B Setpoint | 1000 ppm | Activated carbon HIGH-HIGH organic vapor concentration setpoint                                    |

## Page 3 - Blower Control and Blower Discharge Data

This page provides operator control of each of the three blowers and display of the measured discharge conditions of each of the blowers. A representation of this screen is provided on Figure 4. Specific displays and controls include the following:

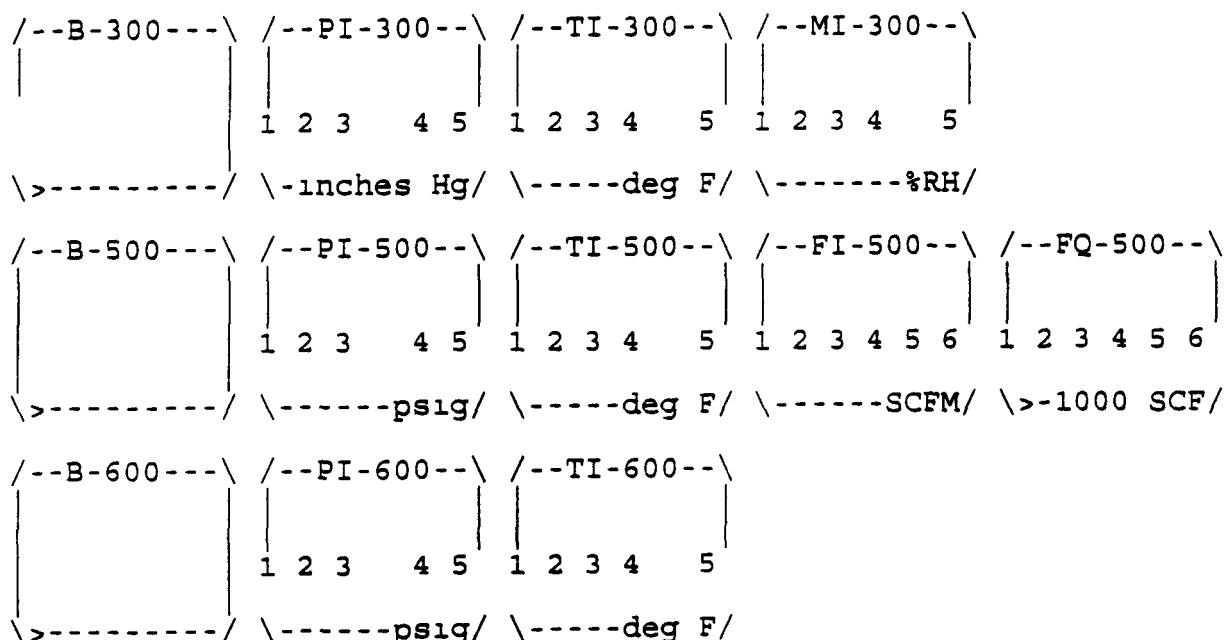
### FIGURE 3

PAGE 2 FID Information



**FIGURE 4**

PAGE 3 Blower Control & Blower Discharge Data



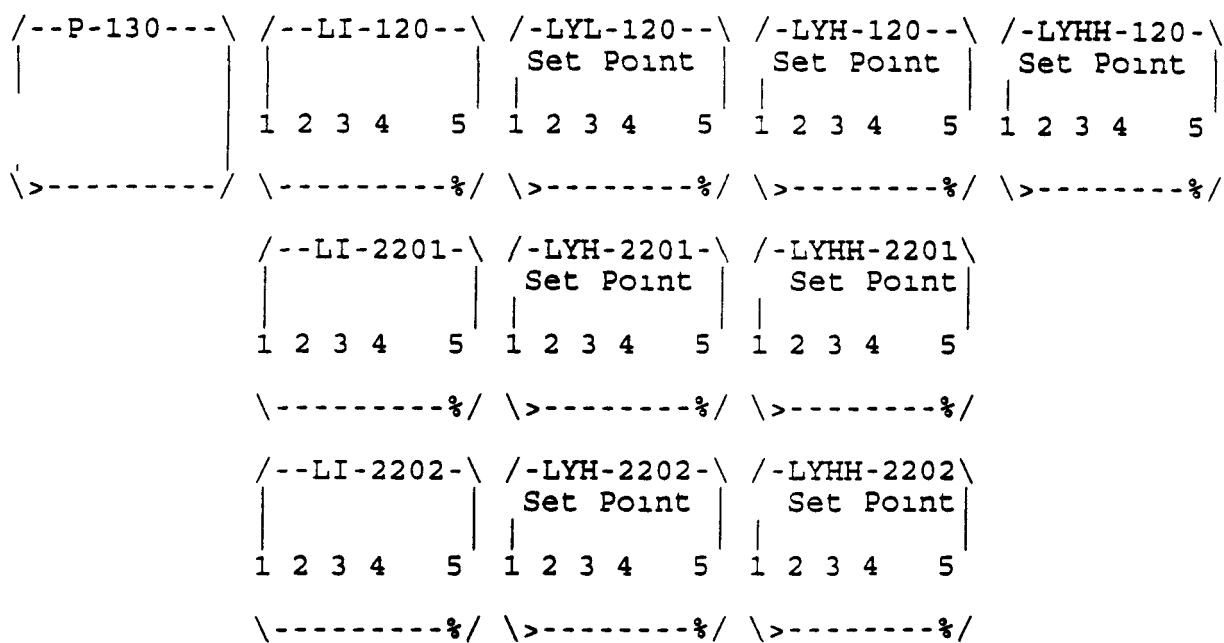
| Identification | Units     | Description                                                  |
|----------------|-----------|--------------------------------------------------------------|
| B-300 HOA      | none      | Blower B-300 HOA switch                                      |
| PI-300         | in HG vac | Blower B-300 discharge pressure                              |
| TI-300         | deg F     | Blower B-300 discharge temperature                           |
| MI-300         | % RH      | Blower B-300 discharge relative humidity                     |
| B-500 HOA      | none      | Blower B-500 HOA switch                                      |
| PI-500         | PSIG      | Blower B-500 discharge pressure                              |
| TI-500         | deg F     | Blower B-500 discharge temperature                           |
| FI-500         | SCFM      | Blower B-500 discharge flowrate<br>System discharge flowrate |
| FQ-500         | 1000 SCFM | Blower B-500 discharge total flow<br>System total flow       |
| B-600 HOA      | none      | Blower B-600 HOA switch                                      |
| PI-600         | PSIG      | Blower B-600 discharge pressure                              |
| TI-600         | deg F     | Blower B-600 discharge temperature                           |

#### Page 4 - Pump Control and Tank Levels

This page provide operator control of the knockout drum transfer pump (P-130) and provides level information for the ground water storage tanks T-2201 and T-2202 A representation of this screen is provided on Figure 5 Specific displays and controls include the following

## FIGURE 5

PAGE 4 Pump Control & Tank Levels



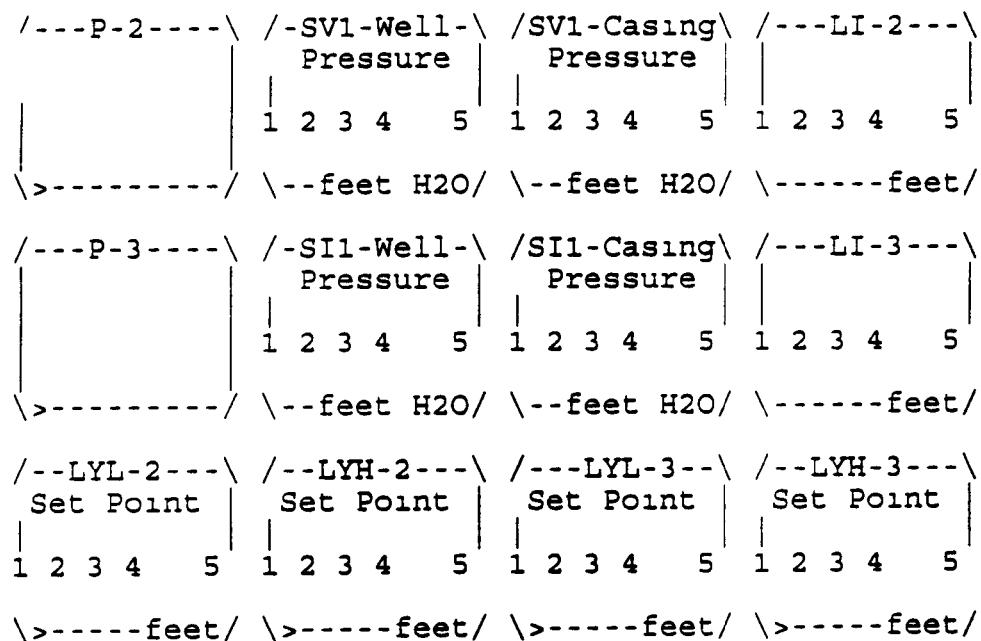
| Identification        | Units   | Description                            |
|-----------------------|---------|----------------------------------------|
| P-130 HOA             | none    | Knockout drum transfer pump HOA switch |
| LI-120                | Percent | Tank level, knockout drum              |
| LYL-120               | Percent | Knockout drum LOW level setpoint       |
| LYH-120               | Percent | Knockout drum HIGH level setpoint      |
| LYHH-120              | Percent | Knockout drum HIGH-HIGH level setpoint |
| LI-2201               | Percent | Tank T-2201 level                      |
| LYH-2201<br>Setpoint  | Percent | Tank T-2201 HIGH level setpoint        |
| LYHH-2201<br>Setpoint | Percent | Tank T-2201 HIGH-HIGH level setpoint   |
| LI-2202               | Percent | Tank T-2202 level                      |
| LYH-2202<br>Setpoint  | Percent | Tank T-2202 HIGH level setpoint        |
| LYHH-2202<br>Setpoint | Percent | Tank T-2202 HIGH-HIGH setpoint         |

### Page 5 - Well Information

This page provides control of the ground water pumps (P-2, P-3) and displays pressure information for both the extraction and injection wells. A representation of this screen is provided on Figure 6. Specific displays and controls include the following:

## FIGURE 6

PAGE 5 Well Information



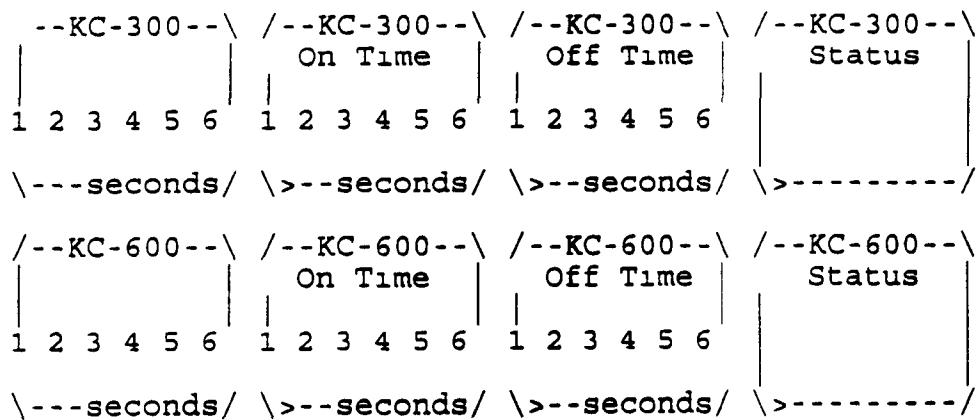
| Identification      | Units                 | Description                             |
|---------------------|-----------------------|-----------------------------------------|
| P-2 HOA             | none                  | Extraction well pump HOA switch         |
| SV1 Well Pressure   | feet H <sub>2</sub> O | Extraction well bubbler pressure        |
| SV1 Casing Pressure | feet H <sub>2</sub> O | Extraction well casing pressure         |
| LI-2                | feet                  | Extraction well water level             |
| P-3 HOA             | none                  | Injection well pump HOA switch          |
| SI1 Well Pressure   | feet H <sub>2</sub> O | Injection well bubbler pressure         |
| SI1 Casing Pressure | feet H <sub>2</sub> O | Injection well casing pressure          |
| LI-3                | feet                  | Injection well water level              |
| LYL-2 Setpoint      | feet                  | Extraction well pump LOW level setpoint |
| LYH-2 Setpoint      | feet                  | Extraction well HIGH level setpoint     |
| LYL-3 Setpoint      | feet                  | Injection well LOW level setpoint       |
| LYH-3 Setpoint      | feet                  | Injection well HIGH level setpoint      |

### Page 6 - Timers

The operator is able to control the blower timers from this screen. A representation of this screen is provided on Figure 7. Specific displays and controls include the following:

**FIGURE 7**

PAGE 6 Timers



| Identification  | Units   | Description                                 |
|-----------------|---------|---------------------------------------------|
| KC-300          | Seconds | Blower B-300/B-500 timer remaining time     |
| KC-300 On Time  | Seconds | Blower B-300/B-500 run duration             |
| KC-300 Off Time | Seconds | Blower B-300/B-500 off duration             |
| KC-300 Status   | none    | Blower B-300/B-500 timer status (ON or OFF) |
| KC-600          | Seconds | Blower B-600 timer remaining time           |
| KC-600 On Time  | Seconds | Blower B-600 run duration                   |
| KC-600 Off Time | Seconds | Blower B-600 off duration                   |
| KC-600 Status   | none    | Blower B-600 timer status (ON or OFF)       |

The display indicates the amount of time that remains on the active timer. A timer status advises whether the ON or OFF timer is currently active. The ON and OFF times can be set from this screen. In addition, the timer can be reset to begin timing the ON time from zero minutes.

#### Page 7 - System Alarms and Setpoints

This screen provides indication of the current numeric value for the system alarms. A representation of this screen is provided in Figure 8. Password protected set points for each of these alarms are set from this screen. In addition, the set points on the high temperature alarms can be set upon proper identification of the password. Finally, a system reset after a oxygen or combustible gas alarm is provided. This reset allows the system to be restarted. Specific displays and controls include the following:

**FIGURE 8**

PAGE 7 System Alarms and Setpoints

```
/-AE-1001--\ /-AE-1002--\ /-AE-1003--\ /--Alarm---\  
|           |           |           | Reset  
2 3 4      5           1 2 3 4      5           1 2 3 4      5  
\---%Oxygen/ \-----%LFL/ \-----%LFL/ \>-----/  
  
/-AAL-1001-\ /-AAH-1002-\ /-AAH-1003-\ /-TAH-GAC--\  
Set Point   Set Point   Set Point   Set Point  
1 2 3 4      5           1 2 3 4      5           1 2 3 4      5  
\>--%Oxygen/ \>-----%LFL/ \>-----%LFL/ \>----deg F/  
  
/-TAH-300--\ /-TAH-500--\ /-TAH-600--\ /-TAHH-GAC-\  
Set Point   Set Point   Set Point   Set Point  
1 2 3 4      5           1 2 3 4      5           1 2 3 4      5  
\>----deg F/ \>----deg F/ \>----deg F/ \>----deg F/
```

| Identification    | Units    | Description                                            |
|-------------------|----------|--------------------------------------------------------|
| AE-1001           | % Oxygen | Trailer oxygen sensor display                          |
| AE-1002           | % LFL    | Trailer combustible gas display                        |
| AE-1003           | % LFL    | In-line combustible gas display                        |
| Alarm Reset       | none     | System reset from AE-1002, AE-1003                     |
| AAL-1001 Setpoint | % Oxygen | Trailer LOW oxygen sensor alarm setpoint               |
| AAH-1002 Setpoint | % LFL    | Trailer HIGH combustible gas alarm setpoint            |
| AAH-1003 Setpoint | % LFL    | In-line HIGH combustible gas alarm setpoint            |
| TAH-300 Setpoint  | deg F    | Blower B-300 HIGH temperature setpoint                 |
| TAH-500 Setpoint  | deg F    | Blower B-500 HIGH temperature setpoint                 |
| TAH-600 Setpoint  | deg F    | Blower B-600 HIGH temperature setpoint                 |
| TAH GAC           | deg F    | Activated carbon column HIGH temperature setpoint      |
| TAHH GAC          | deg F    | Activated carbon column HIGH-HIGH temperature setpoint |

#### 4.1.2 Programmable Logic Controller

The programmable logic controller (PLC) is an Allen-Bradley 5/15. The PLC provides all control functions for the SVE Pilot Unit. This includes actual control of all unit rotating equipment as well as receipt and interpretation of all instrumentation signals, and the initiation of annunciation of all unit alarm conditions.

Programming documentation for the PLC is provided in Appendix B 2. An on-line terminal unit has been provided so that programming may be changed as field conditions dictate.

## 4.2 EXTRACTED VAPOR SYSTEM

The extracted vapor system will remove the organic compounds from the soil system under study. These vapor are processed through moisture elimination, HEPA filtration, and granular activated carbon. Operating procedures for each of these systems are provided in the following sections.

### 4.2.1 Vacuum Blowers

#### Description/Specifications

Vacuum blowers for the extracted vapor system include B-300 and B-500. General specifications for these blowers are as follows:

| Parameter                                 | B-300 | B-500 |
|-------------------------------------------|-------|-------|
| Maximum Vacuum, in Hg vacuum              | 15    | 18    |
| Maximum Flow, scfm                        | 600   | 500   |
| Vacuum Relief Valve setting, in Hg vacuum | 10    | 15    |
| Pressure Relief Valve Setting, psig       | 5     | 5     |
| Calculated Temperature Rise, °F           | 100   | 60    |
| Motor Horsepower                          | 15    | 25    |
| Motor RPM                                 | 1,800 | 1,800 |

#### Control Logic

Both of the vapor extraction blowers are operated by the same logic. One blower will not operate unless the other is also set for the same mode of operation. The blowers are controlled from Page 3 of the graphic interface panel.

To start the blowers, go to Page 3 and select one of the following modes of operation:

- OFF - Turns the blower off and cancels the AUTOMATIC or TIMED mode of operation
- ON - The blower will operate while the button is depressed
- AUTOMATIC - Places the blower into the AUTOMATIC mode. If there are no alarm conditions present, the blower will turn on
- TIMED - Places the blower into the TIMED mode

Indication of the mode of operation is provided for operator information as follows

- ALARM - Blower operation has been stopped by an alarm condition
- ON - Blower is operating
- TIMED OPERATION - The blower is in the TIMED mode of operation, but not operating. This mode is similar to the AUTOMATIC mode except that in addition to the various blower shut downs, the blower operation is controlled by an operator adjustable timer
- AUTOMATIC OPERATION - The blower is in the AUTOMATIC mode of operation, but not operating
- OFF - The blower is not operating and not in the AUTOMATIC or TIMED mode of operation

If the TIMED mode is to be selected, first go to Page 6 and input the time period. The ON time is the period of time that the blower will operate prior to turning off. The OFF time is the period of time that the blower will be off prior to restarting again.

If either the AUTOMATIC mode or TIMED mode are selected, the blower(s) will start provided the following operating conditions are met

- Outlet temperature of both blowers is not HIGH
- Level in the knockout drum is not HIGH
- No system shutdown conditions exist

Either blower can be operated whenever the ON pushbutton is depressed provided that the system shutdown conditions are not in effect. The blower will stop when the ON pushbutton is released.

### **Alarms**

Alarms associated with the operation of the blowers include the following:

| Alarm Designation | Description                       | Response/Action          |
|-------------------|-----------------------------------|--------------------------|
| TAH-300           | HIGH Discharge Temperature, B-300 | B-300 automatic shutdown |
| TAH-500           | HIGH Discharge Temperature, B-500 | B-500 automatic shutdown |

Any of these alarm conditions or a blower alarm caused by the motor overload heaters tripping, will take the blowers out of the AUTOMATIC or TIMED mode of operation. Once the alarm condition has been cleared, the ALARM RESET button on Page 7 of the graphic interface panel must be depressed before either blower can be restarted.

### **Setpoints**

Setpoints associated with the vacuum blowers include the following:

| Setpoint Designation | Description                      | Recommended Setting | Operator Adjustable |
|----------------------|----------------------------------|---------------------|---------------------|
| TAH-300              | B-300 HIGH Discharge Temperature | 300°F               | Yes, page 7         |
| TAH-500              | B-500 HIGH Discharge Temperature | 300°F               | Yes, page 7         |

|                                                                                                                               |                                               |                                                                                          |
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#### 4.2.2 Flow Control Station for Extracted Vapor and Makeup Air

##### Description/Specifications

The system actually has two sources of air for the extracted vapor blowers. The primary source is through the vapor extraction line tied to the vapor extraction well(s). The second source is makeup air pulled from outside the trailer through a wire mesh air filter. This filter element should be inspected daily and cleaned if significant amounts of visible dust/dirt are observed. The filter is cleaned by removing it from the housing and washing it with a hose.

A flow control station is provided external to the trailer for precise control of the extracted vapor flowrate, the makeup air flowrate, and the total system flowrate. This flow control station consists of the following major components

- Extracted vapor and makeup air control valves
- Makeup air orifice plate
- Remote flow displays
- Organic vapor concentration

The purpose of the flow control station is to allow the operator to continually adjust the ratio of extracted vapor to makeup air based on the desired total flow and the organic vapor concentration in either the system feed or the activated carbon system feed.

##### Control Logic

This is a manual operation, and is not influenced by any other system controls.

Orifice plates are provided to place backpressure on the makeup air line thereby increasing the achievable vacuum level in the extraction well. Each orifice plate is clearly marked as to the makeup air range for which it is applicable. The orifice is placed between two flanges on the makeup air spool installed as part of the flow control station.

|                                                                                                                               |                                               |                                                                                          |
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## Alarms

There are no alarms associated with this system

## Setpoints

There are no setpoints associated with this system

### 4.2.3 Vapor Organic Compound Concentration Monitoring System

#### Description/Specifications

There are reports that potentially dangerous fires can occur in soil vapor extraction systems if high concentration organic "slugs" are processed through activated carbon columns. The specific mechanisms for such a fire are not clear, but are likely due to one of the following

- Achievement of a lower flammable limit for a given compound
- Ignition of oxygen within the pore structure of the carbon due to high temperatures caused by the heat of adsorption of the carbon for a particular organic compound
- Ignition of the coating of the activated carbon column due to high temperatures caused by the heat of adsorption of the carbon for a particular organic compound

The determination of the maximum vapor organic compound concentration which is acceptable is based on multiple factors including the type of organic compounds present, their relative concentrations, their adsorptive characteristics onto the activated carbon, and the type and properties of the carbon being used

One way to minimize the fire danger is to measure the total organic compound content in both the system feed and the feed to the lead activated carbon column. Control valves are provided as discussed previously to increase the makeup air volume if a "slug" of organic vapors is produced from the extraction well.

A Flame Ionization Detector (FID) is provided to continually measure the total organic compound concentration at the following points

- Extracted vapor prior to dilution with makeup air
- Lead activated carbon column feed

The FID is a complicated piece of equipment requiring frequent calibration. The instructions provided by the manufacturer should be adhered to strictly throughout all system operations.

### Control Logic

The operator can select the desired sample point by use of a selector switch on the FID panel. Since each sample point has different setpoints, the operator must also go to Page 2 of the graphic interface panel and select the appropriate sampling location. This will enable the setpoints for that particular sample point. Page 2 also provides a visual display of the organic vapor concentration. A remote readout of the extracted vapor concentration will also be provided to the operator at the flow control station.

### Alarms

Alarms associated with this system include the following:

| Alarm Designation | Description                                               | Response/Action           |
|-------------------|-----------------------------------------------------------|---------------------------|
| AAH-1006A         | HIGH Extracted Vapor Organic Compound Concentration       | Alarm annunciation        |
| AAHH-1006A        | HIGH-HIGH Extracted Vapor Organic Compound Concentration  | System automatic shutdown |
| AAH-1006B         | HIGH Activated Carbon Organic Compound Concentration      | Alarm annunciation        |
| AAHH-1006B        | HIGH-HIGH Activated Carbon Organic Compound Concentration | System automatic shutdown |

| Alarm Designation | Description                                                                                                                                                                                                                                                                                                  | Response/Action |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| NOTE              | The two separate sampling locations share a common alarm on the annunciator panel, hence the same instrument number. A switch is provided on Page 2 of the graphic interface panel to select which sample point is currently applicable. This switch enables the correct setpoints for that sample location. |                 |

### Setpoints

Setpoints associated with this system include the following

| Setpoint Designation | Description                                               | Recommended Setting | Operator Adjustable |
|----------------------|-----------------------------------------------------------|---------------------|---------------------|
| AAH-1006A            | HIGH Extracted Vapor Organic Compound Concentration       | 10,000 ppm          | Yes, page 2         |
| AAHH-1006A           | HIGH-HIGH Extracted Vapor Organic Compound Concentration  | 15,000 ppm          | Yes, page 2         |
| AAH-1006B            | HIGH Activated Carbon Organic Compound Concentration      | 5,000 ppm           | Yes, page 2         |
| AAHH-1006B           | HIGH-HIGH Activated Carbon Organic Compound Concentration | 10,000 ppm          | Yes, page 2         |

NOTE The two separate sampling locations share a common alarm on the annunciator panel, hence the same instrument number. A switch is provided on Page 2 of the graphic interface panel to select which sample point is currently applicable. This switch enables the correct setpoints for that sample location.

|                                                                                                                               |                                               |                                                                                          |
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#### 4.2.4 Knockout Drum

##### Description/Specifications

The knockout drum (D-120) is used as a mist eliminator to ensure a dry air source for the HEPA filters. Any liquid collected will be pumped intermittently, based on liquid level (LT-120), by pump P-130. The liquid is pumped through double containment piping which is monitored with a leak detection system (LS-1005). The liquid level in the knockout drum is monitored by a capacitance level probe (LT-120) and reported to the PLC. Should liquid level reach the high alarm level (LAHH-120), the PLC will shut down blowers B-300 and B-500, and thus the vapor extraction system.

##### Control Logic

The knockout drum transfer pump (P-130) is controlled from Page 4 of the graphic interface panel. To start the pump, go to Page 4 and select one of the following modes of operation

- OFF - Turns the pump off and cancels the AUTOMATIC mode of operation
- ON - The pump will operate while the button is depressed
- START - Provided the pump is in AUTOMATIC mode, this button will begin operation of the pump, until the knockout drum has been pumped to the LOW level
- AUTOMATIC - Places the pump into the AUTOMATIC mode. If there are no alarm conditions present, the pump will turn on when HIGH level is reached.

Indication of the mode of operation is provided for operator information as follows

- ALARM - Pump operation has been stopped by an alarm condition
- ON - Pump is operating
- AUTOMATIC OPERATION - The pump is in the AUTOMATIC mode of operation, but not operating

- OFF - The blower is not operating and not in the AUTOMATIC or TIMED mode of operation

This pump will operate whenever the equipment is in AUTOMATIC mode provided that the following conditions are met

- Level in the knockout drum is HIGH but has not been yet pumped to LOW
- Level in ground water storage tanks (T-2201, T-2202) is not HIGH
- No system shutdown conditions exist

The pump will operate whenever the ON pushbutton is depressed provided that no automatic shutdown conditions exist. The pump will stop when the ON pushbutton is released. By pressing the START pushbutton on the graphic interface panel operation of the pump will begin if the pump is in the AUTOMATIC mode and continue until the knockout drum has been pumped to the LOW level.

### Alarms

Alarms associated with the operation of the knockout drum include the following

| Alarm Designation | Description                   | Response/Action           |
|-------------------|-------------------------------|---------------------------|
| LYHH-120          | HIGH-HIGH Knockout Drum Level | System automatic shutdown |

Any of these alarm conditions or a pump alarm caused by the motor overload heaters tripping, will take the pump out of the AUTOMATIC or TIMED mode of operation. Once the alarm condition has been cleared, the ALARM RESET button on Page 7 of the graphic interface panel must be depressed before the pump can be restarted.

### Setpoints

Setpoints associated with the knockout drum include the following

| Setpoint Designation | Description                   | Recommended Setting | Operator Adjustable |
|----------------------|-------------------------------|---------------------|---------------------|
| LYH-120              | HIGH Knockout Drum Level      | 20%                 | Yes, page 4         |
| LYHH-120             | HIGH-HIGH Knockout Drum Level | 75%                 | Yes, page 4         |
| LYL-120              | LOW Knockout Drum Level       | 95%                 | Yes, page 4         |

#### 4.2.5 HEPA Filtration

##### Description/Specifications

The HEPA Filtration System is used to remove any particulate material extracted from the extraction wells. Each HEPA filter unit consists of a prefilter and a HEPA filter. The filter is similar to a home furnace filter, and is used as a coarse filter to remove large particulate matter. The HEPA filter itself is designed for removal of very small particulate material, and is rated at 99.97% efficient for removal of particulates 0.3 microns and smaller.

Three filters are included in the system (FL-200, FL-210, FL-220). The flow of air can be routed through the HEPA filters in various configurations depending on the system airflow. Per Rocky Flats Plant Standard SMU-401, Standard for HEPA Filter, General Purpose, the nominal capacity of the various size HEPA filters is as follows:

| Tag    | Size        | Rated Capacity (scfm) |
|--------|-------------|-----------------------|
| FL-200 | 24x24x5-7/8 | 500                   |
| FL-210 | 12x12x5-7/8 | 125                   |
| FL-220 | 24x24x5-7/8 | 500                   |

The recommended arrangement of these filters as a function of flow are as follows:

| Flow (scfm) | FL-200 | FL-210 | FL-220 |
|-------------|--------|--------|--------|
| 100         |        | X      |        |
| 200         | X a/   |        |        |
| 300         | X a/   |        |        |
| 400         | X a/   |        |        |
| 500         | X a/   |        |        |
| 600         | X      | X      |        |
| >600        | X      |        | X      |

NOTES a/ FL-220 may be operated in lieu of FL-200 at these conditions  
Only one of the units is actually on-line

Using more filters than are required by the above recommendations will not have an adverse affect on the performance of the unit. Filters can be placed on line or isolated by using the butterfly valves on the inlet and outlet of each filter. **CAUTION:** Making adjustments on the filter while the blowers are in service must be done carefully. Always make sure the blowers have an air source before isolating the filter.

### Control Logic

There are no automatic controls for the HEPA filters. Each prefilter and HEPA filter has been provided with differential pressure gauges (PDI-200, PDI-201, PDI-210, PDI-211, PDI-220, PDI-221) to report the pressure drop across each filter. These gauges are for local readout only and must be inspected by the operator on a regular basis. Remote differential pressure measurement is also displayed (PI-200, PI-201) to provide an overall pressure drop reading across the HEPA filter system, total.

Each of the HEPA filters is equipped with inlet and outlet isolation valves. Valve lineups for each of the filters are as follows:

| Valve Number | Filter: FL-200 | Filter: FL-210 | Filter: FL-220 |
|--------------|----------------|----------------|----------------|
| VE-1         | OPEN           | --             | --             |
| VE-4         | OPEN           | --             | --             |
| VE-2         | --             | OPEN           | --             |
| VE-5         | --             | OPEN           | --             |
| VE-3         | --             | --             | OPEN           |
| VE-6         | --             | --             | OPEN           |

Note OPEN represents the valve position required to place the filter in service

### Alarms

There are no alarms associated with this system

### Setpoints

There are no setpoints associated with this system

### Filter Replacement

Changeout of either prefilters or the HEPA filters is determined on the basis of pressure drop. Expected pressure drops for "clean" filters, and the changeout criteria for each type of filter are as follows

| Filter Type                            | Pressure Drop, Clean<br>Inches Water | Pressure Drop, Dirty<br>Inches Water |
|----------------------------------------|--------------------------------------|--------------------------------------|
| Prefilter                              | 0.25                                 | 0.5                                  |
| HEPA Filter, 12x12<br>(FL-210)         | 1.25                                 | 4.0                                  |
| HEPA Filter, 24x24<br>(FL-200, FL-220) | 1.0                                  | 4.0                                  |

When a changeout of the prefilter and/or HEPA filter is required, the following procedure should be followed

## **GENERAL**

- Step 1** Prepare work area per Rocky Flats Plant Radiation Protection procedures
- Step 2** Isolate filter housing to be opened by closing inlet and outlet isolation valves

## **PREFILTERS**

***Before beginning procedure, make safety provisions to stop air flow.***

- Step 1** Remove the housing access cover by removing the four aluminum knobs and pulling the door towards you
- Step 2** Turn filter housing locking mechanism with the provided T-handle in a clockwise direction until it reaches its full open position *Full open position occurs when the travel nuts contact the guide blocks and the T-handle no longer turns*
- Step 3** Remove used filter carefully so that loose solids are not dislodged. Dispose of filter in accordance with the WSRIC document applicable to this project
- Step 4** Position the new filter element into the housing opening while insuring that the filter element being installed is in the correct orientation. Slide filter element into the housing while taking precaution not to damage the filter. Note that the prefilters do not have a gasket seal. Use the pressure bars of the locking mechanism as a guide and gently but firmly, push the filter element until it touches the back of the housing or adjacent filter element(s)
- Step 5** Seal and lock the filter in place by alternately rotating each locking mechanism. With the provided T-handle, first rotate one locking mechanism counter-clockwise two turns. Then turn the other locking mechanism two turns. Alternate procedure until completely tightened. Do not overtighten as prefilter housing is only made of fiberboard and is only semi-rigid

When the filter element is completely sealed, the filter travel-nut-contact will stop while you turn it in the counter-clockwise direction

- Step 6** Replace the access door Tighten the aluminum knobs alternately until the door is securely sealed

### **HEPA FILTERS**

***Before beginning procedure, make safety provisions to stop air flow.***

- Step 1** Remove the housing access cover by removing the four aluminum knobs and pulling the door towards you
- Step 2** Turn each filter locking mechanism With the provided T-handle in a clockwise direction until it reaches its full open position *Full open position occurs when the travel nuts contact the guide blocks and the T-handle no longer turns*
- Step 3** Remove used HEPA filter carefully Dispose of filter per the WSRIC document applicable to this project
- Step 4** Evenly coat the entire face of the new filter gasket with a silicone grease This prevents the filter gaskets from sticking to the housing sealing surface and will help achieve and maintain a good filter-to-housing seal
- Step 5** Position the filter element into the housing opening (with gasket facing the sealing surface) while insuring the filter element being installed is in the correct orientation. Install HEPA according to manufacturer's instructions Slide filter element into the housing while taking precaution not to damage the gasket Use the pressure bars of the locking mechanism as a guide by butting the non-gasket side of the filter element until it touches the back of the housing
- Step 6** Seal and lock the filter in place by alternately rotating each locking mechanism With the provided T-handle, first rotate one locking mechanism counter-clockwise two turns Then turn the other locking mechanism two turns Alternate procedure until completely tightened *The T-handle will not turn when completely tightened*

When the filter element is completely sealed, the filter travel-nut-contact will stop while you turn it in the counter-clockwise direction. The 1/4" gasket will be compressed to approximately 1/8" to give a proper seal.

- Step 7** Replace the access door. Tighten the aluminum knobs alternately until the door is securely sealed.
- Step 8** As per site testing procedure, a DOP test and/or freon test should be run after the assembly has been completed to assure proper installation.

#### 4.2.6 Granular Activated Carbon

##### Description/Specifications

The granular activated carbon system (D-400, D-410) is used to remove organic contaminants from the extracted vapor. The columns are four feet in diameter and approximately 7.5 feet tall. They are ASME code stamped vessels rated for full vacuum. Basic design limits on the vessels are as follows:

| Parameter                                       | Value  |
|-------------------------------------------------|--------|
| Maximum Vacuum, in Hg vacuum                    | Full   |
| Maximum Pressure, psig (at maximum temperature) | 12     |
| Maximum Temperature, °F                         | 650    |
| Maximum Total Organic Concentration, ppm        | 15,000 |

Each column contains approximately 1,800 pounds of a coconut based activated carbon (Westates VACarb or equivalent). Specifications for the carbon are as follows:

|                                  |               |
|----------------------------------|---------------|
| Size (U S Sieve)                 | 4x8           |
| Type                             | Coconut Shell |
| Hardness no (min ,wt %)          | 97            |
| Ash (max ,wt %)                  | 2             |
| Moisture (max as packaged, wt %) | 2             |

|                        |                        |
|------------------------|------------------------|
| Retentivity (wt %)     | 40                     |
| Surface area (B E T )  | 1250 m <sup>2</sup> /g |
| Pore volume            | 0.55 cc/g              |
| Mean particle diameter | 3.4 mm                 |
| Apparent density       | 29 lb /ft <sup>3</sup> |

### Control Logic

There are no automatic controls for this system. Inlet and discharge pressure are measured and displayed for each column (PI-300, PI-400, PI-410)

The degree of exhaustion of the carbon bed will be based on periodic gas samples taken from the feed and discharge of each column. The decision to replace the carbon will be made on experience, and will be based on the breakthrough characteristics that are observed. The different scenarios are as follows:

- (1) The lead column could load in a fairly uniform manner. In this case, breakthrough and exhaustion will be close to one another, and the inlet and outlet concentrations will approach each other very rapidly.
- (2) The lead column could load chromatographically. In this case, small amounts of organic compounds will gradually begin to appear in the outlet stream. This concentration will increase as the column continues to load, and will eventually be equal to the inlet concentration. In this type of operation, the lag column acts as a polisher. It should be noted that when the lag column is moved to the lead position, it will already be partially exhausted.

In applications with a complex mixture of organic compounds, scenario 2 is more likely. The actual decision to replace the lead column should be based on the length of time that breakthrough occurs prior to exhaustion. Caution must be observed if the breakthrough occurs very slowly to avoid having the lag column breakthrough prior to removal of the lead column from service.

Upon exhaustion, the carbon in the lead column is replaced. To replace the lead carbon column contents, the column is removed from the trailer by removing the column anchor bolts. Note that the outboard guide rails on the trailer floor can be slid back away from the carbon column base channels. After removing the bolts, remove the lead carbon column from the trailer and replace the carbon. The new column is then placed back in

the trailer in the lag position. This requires that the original lag column be removed from the trailer and replaced in the lead position.

As discussed previously, high concentrations of organic compounds can cause significant temperature excursions in activated carbon columns. As a safety precaution, thermowells and temperature sensors have been installed in each of the carbon columns. Each column will be monitored for carbon bed temperature at depths of approximately 2, 4, and 6 feet.

### Alarms

Alarms associated with the activated carbon system include the following:

| Alarm Designation | Description                                                                                                                                                                                                                                                                                                                                                                                       | Response/Action           |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| TAH-400           | HIGH Carbon Temperature, Column T-400                                                                                                                                                                                                                                                                                                                                                             | Alarm annunciation        |
| TAHH-400          | HIGH-HIGH Carbon Temperature, Column T-400                                                                                                                                                                                                                                                                                                                                                        | System automatic shutdown |
| TAH-410           | HIGH Carbon Temperature, Column T-410                                                                                                                                                                                                                                                                                                                                                             | Alarm annunciation        |
| TAHH-410          | HIGH-HIGH Carbon Temperature, Column T-410                                                                                                                                                                                                                                                                                                                                                        | System automatic shutdown |
| NOTE              | There are three temperature sensors installed in each activated carbon column at three different depths in the bed. Each HIGH or HIGH-HIGH alarm could be caused by any of these sensors. To determine the specific area of excessive temperature, the displays on each of the temperature transmitters located on the wall of the process area near the activated carbon columns can be checked. |                           |

### Setpoints

Setpoints associated with the activated carbon system include the following:

| Setpoint Designation | Description                       | Recommended Setting | Operator Adjustable |
|----------------------|-----------------------------------|---------------------|---------------------|
| TAH-GAC              | HIGH Temperature, any sensor      | 350°F               | Yes, page 7         |
| TAHH-GAC             | HIGH-HIGH Temperature, any sensor | 450°F               | Yes, page 7         |

### Carbon Replacement

The following procedure should be used for spent carbon removal and replacement

- Step 1** Once the carbon has been determined to be spent, it must be removed from the vessel and replaced with fresh carbon. Spent carbon shall be handled and disposed of in accordance with the WSRIC document applicable to this project
- Step 2** The removal of spent carbon will typically require the use of 40 hour OSHA trained personnel. Vapor phase carbon is usually dry and dusty. Proper eye, respiratory, and clothing should be worn (Review the Material Data Safety Sheet for additional information)
- Step 3** The GPC-13 vessel has one 16 inch diameter manway on the side of the vessel. The 6 inch flanged opening on the top should be used for loading and unloading the spent carbon. A vacuum system of sufficient power is required to remove the spent carbon to another bulk tank or open head drums. The bulk super sacks have a carbon capacity of 1,000 pounds. 55 gallon drums have a capacity of 180 pounds
- Step 4** In some cases it may be cost effective to have a vacuum truck remove the spent carbon. This same vessel may also be able to deliver the fresh carbon to the GPC-13 vessel
- Step 5** When the vessel is empty, check to make sure the hub and lateral distribution system is in place. The fresh carbon can now be loaded into the vessel via the top 6 inch flange. Bulk sacks is the easiest way to load the vessel by manual methods. A lifting device will be required to move the

bulk sack into the proper position. An operator will have to open the bottom of the bulk sack and allow the carbon to flow into the vessel.

- Step 6** When the desired amount of fresh carbon has been added to the GPC-13 vessel, reattach the appropriate piping before start-up.

#### 4.3 AIR INJECTION SYSTEM

##### Description/Specifications

The air injection system is used to supply clean air to the wellfield to investigate soil permeability properties. The only equipment in this system is the air injection blower (B-600). The make-up air line is supplied with a wire mesh filter element and housing. This filter element should be inspected regularly and cleaned as necessary. General specifications for the blower are as follows:

| Parameter                                 | B-600 |
|-------------------------------------------|-------|
| Maximum Vacuum, in Hg vacuum              | N/A   |
| Maximum Flow, scfm                        | 200   |
| Vacuum Relief Valve setting, in Hg vacuum | 5     |
| Pressure Relief Valve Setting, psig       | 5     |
| Calculated Temperature Rise, °F           | 100   |
| Motor Horsepower                          | 7.5   |
| Motor RPM                                 | 1,800 |

##### Control Logic

This blower is operated separately from the other two blowers, including a separate timer. To start the blower, go to Page 3 on the graphic interface panel and select one of the following modes of operation:

- OFF - Turns the blower off and cancels the AUTOMATIC or TIMED mode of operation
- ON - The blower will operate while the button is depressed
- AUTOMATIC - Places the blower into the AUTOMATIC mode. If there are no alarm conditions present, the blower will turn on
- TIMED - Places the blower into the TIMED mode

Indication of the mode of operation is provided for operator information as follows

- ALARM - Blower operation has been stopped by an alarm condition
- ON - Blower is operating
- TIMED OPERATION - The blower is in the TIMED mode of operation, but not operating. This mode is similar to the AUTOMATIC mode except that in addition to the various blower shut downs, the blower operation is controlled by an operator adjustable timer
- AUTOMATIC OPERATION - The blower is in the AUTOMATIC mode of operation, but not operating
- OFF - The blower is not operating and not in the AUTOMATIC or TIMED mode of operation

If the TIMED mode is to be selected, first go to Page 6 on the graphic interface panel and input the time period. The ON time is the period of time that the blower will operate prior to turning off. The OFF time is the period of time that the blower will be off prior to restarting again.

If either the AUTOMATIC mode or TIMED mode are selected, the blower will start provided the following operating conditions are met

- Outlet temperature of the blower is not HIGH
- No system shutdown conditions exist

The blower can be operated whenever the ON pushbutton is depressed provided that the system shutdown conditions are not in effect

In addition to the automatic controls, there is a manual system for airflow control. A manually operated bleed valve is provided on the discharge side of the air injection blower. Closing this valve all the way provides the maximum pressure and flow to the injection well. Partial opening of this valve will regulate the injection air flow and pressure. The degree of regulation of the injection air will depend on the observed vacuum conditions in the injection well.

### Alarms

Alarms associated with the air injection system include the following

| Alarm Designation | Description                       | Response/Action          |
|-------------------|-----------------------------------|--------------------------|
| TAH-600           | HIGH Blower Discharge Temperature | B-600 automatic shutdown |

Any of these alarm conditions or a blower alarm caused by the motor overload heaters tripping, will take the blower out of the AUTOMATIC or TIMED mode of operation. Once the alarm condition has been cleared, the ALARM RESET button on Page x of the graphic interface panel must be depressed before the blower can be restarted.

### Setpoints

Setpoints associated with the air injection blower include the following

| Setpoint Designation | Description                      | Recommended Setting | Operator Adjustable |
|----------------------|----------------------------------|---------------------|---------------------|
| TAH-600              | B-600 HIGH Discharge Temperature | 300°F               | Yes, page 7         |

|                                                                                                                                |                                               |                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------|
| EG&G ROCKY FLATS PLANT<br>Draft OU2 Subsurface IM/IRA<br>Soil Vapor Extraction Pilot Unit<br>Operations and Maintenance Manual | Manual<br>Revision No<br>Page<br>Organization | RFP/ER 94 O&M OU 2 15<br>Revision 0<br>47 of 62<br>Environmental Science and Engineering |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------|

## 4.4 GROUND WATER REMOVAL AND STORAGE SYSTEM

### Description/Specifications

The Ground Water Removal and Storage System consists of submersible pumps (P-2 and P-3) installed in each of the two bedrock wells. One of these wells is the bedrock extraction well and the other the bedrock injection well. Recovered ground water from both wells is pumped to one of two 10,000 gallon storage tanks (T-2201, T-2202). Level transmitters (LT-2201, LT-2202) are provided on both storage tanks. Recovered ground water will be handled as discussed in the WSRIC document applicable to this project.

### Control Logic

The submersible pumps are controlled by the bedrock well level measurement system. This is a bubbler system which measures not only the water level in each well, but also provides a measurement of the casing pressure in each well.

The submersible pumps are controlled from Page 5 on the graphic interface panel. To start the pumps go to this page and select one of the following modes of operation:

- OFF - Turns the pumps off and cancels AUTOMATIC mode of operation
- ON - The pumps will operate while the button is depressed
- START - Provided the pump is in AUTOMATIC mode, this button will begin operation of the pump(s) until the well has been pumped to the LOW level
- AUTOMATIC - Places the pumps into the AUTOMATIC mode. If there are no alarm conditions present, the pump(s) will turn on when HIGH level is reached in the wells

Indication of the mode of operation is provided for operator information as follows:

- ALARM - Pump(s) operation has been stopped by an alarm condition
- ON - Pump(s) are operating
- AUTOMATIC OPERATION - The pump(s) are in the AUTOMATIC mode of operation, but not operating

- OFF - The pump(s) are not operating and not in the AUTOMATIC mode of operation

If the AUTOMATIC mode of operation is selected, the pump(s) will start provided the following conditions are met

- Level in the well is HIGH but has not been pumped to LOW
- Level in the ground water storage tanks (T-2201, T-2202) is not HIGH

Since the submersible pumps are controlled through the main process control system, any automatic shutdown conditions in the extracted vapor treatment system will kill power to both pumps

The pump(s) will operate whenever the ON pushbutton is depressed on the graphic interface panel. The pump(s) will stop when the ON pushbutton is released. By pressing the START pushbutton on the graphic interface panel operation of the pump(s) will begin if the pumps are in the AUTOMATIC mode and continue until the well has been pumped to the LOW level.

### Alarms

Alarms associated with this system include the following

| Alarm Designation | Description             | Response/Action                              |
|-------------------|-------------------------|----------------------------------------------|
| LYHH-2201         | HIGH-HIGH Level, T-2201 | Alarm, P-2, P-3, P-130<br>Automatic shutdown |
| LYHH-2202         | HIGH-HIGH Level, T-2202 | Alarm, P-2, P-3, P-130<br>Automatic shutdown |

### Setpoints

Setpoints associated with this system include the following

| Setpoint Designation | Description                 | Recommended Setting | Operator Adjustable |
|----------------------|-----------------------------|---------------------|---------------------|
| LYH-2201             | HIGH Level, T-2201          | 75%                 | Yes, page 4         |
| LYHH-2201            | HIGH-HIGH Level, T-2201     | 95%                 | Yes, page 4         |
| LYH-2202             | HIGH Level, T-2202          | 75%                 | Yes, page 4         |
| LYHH-2202            | HIGH-HIGH Level, T-2202     | 95%                 | Yes, page 4         |
| LYL-2                | LOW Level, Extraction Well  | 40 feet             | Yes, page 5         |
| LYH-2                | HIGH Level, Extraction Well | 30 feet             | Yes, page 5         |
| LYL-3                | LOW Level, Injection Well   | 40 feet             | Yes, page 5         |
| LYH-3                | HIGH Level, Injection Well  | 30 feet             | Yes, page 5         |

#### 4.5 GAS SAMPLING SYSTEM

##### Description/Specifications

The gas sampling cabinet is the central gathering point for all process system samples. The cabinet is supplied with a vacuum sampling pump (P-700) and a three way valve, number GS-16, to draw samples. The entire gas sampling system is contained in a hood. The hood exhaust fan vents all air to an activated carbon system to remove any trace organic vapors.

**NOTE:** TO ENSURE MAXIMUM PROTECTION OF SAMPLING PERSONNEL, ENSURE THAT HOOD EXHAUST FAN IS TURNED ON DURING ALL SAMPLING ACTIVITIES. IN ADDITION, NEVER OPERATE FOR EXTENDED PERIODS WITH THE HOOD SASH RAISED ABOVE THE INDICATED LEVEL. IN ADDITION ALL SAMPLING ACTIVITIES TO BE PER THE PROJECT SAMPLING AND ANALYSIS PLAN (OU-2 IM/IRA IMPLEMENTATION AND OPERATION PLAN SOIL VAPOR EXTRACTION PILOT TEST RFP/ER-WP-OU2.5).

## Control Logic

All sampling activities are conducted manually, and there are no interfaces with the control system. Prior to sampling, turn ON the exhaust fan and attach the appropriate sample collection container to the hose barb provided. To sample a given stream, position the three way valve (GS-16) to return flow back to the knockout drum (D-120). In addition, open the return line isolation valves (GS-2, GS-10). Open the appropriate process line isolation valve, turn ON the gas sampling pump (P-700), and allow the system to recirculate for a minimum of five minutes. The three way valve can then be moved to the sample position, and the sample isolation valve (GS-13) opened to collect the sample. After the sample is collected, return the three way valve to the purge position, turn the sample pump off, and close the sample isolation valve.

Sampling point locations and corresponding process line isolation valve and sampling cabinet isolation valve numbers are shown on Drawing 504, and are as follows:

- Knockout Drum Discharge/System Feed (GS-3, GS-13)
- HEPA Filter Discharge (GS-6, GS-12)
- Lead Activated Carbon Column Feed (GS-7, GS-11)
- Lead Activated Carbon Column Discharge/Lag Activated Carbon Column Feed (GS-8, GS-14)
- Lag Activated Carbon Column Discharge/System Discharge (GS-9, GS-15)

The sampling pump returns nonsampled gas back to the inlet piping prior to the knockout drum.

## Alarms

There are no alarms associated with this system.

## Setpoints

There are no setpoints associated with this system.

## 4.6 TRAILER SYSTEMS OPERATION

Trailer systems include the following

- Two exhaust fans (main process area),
- Two unit heaters (main process area), and
- Air conditioner/heater (office/lab)

Manufacturers information on all of the equipment is provided in Appendix C Notes on the operation of each of these systems are as follows

### 4.6.1 Exhaust Fans

The exhaust fans are turned on by breakers located in Panel LP These fans are operated as needed for cooling and for operator comfort It is recommended that they be turned on whenever the ambient air temperature exceeds 80°F, or as required for operator comfort

### 4.6.2 Unit Heaters

The unit heaters are turned on by breakers located in Panel LP Each unit heater is equipped with a local thermostat at the front of the unit It is recommended that the heaters be turned on whenever the temperature drops below 50°F, or as required for operator comfort

### 4.6.3 Air Conditioner

The air conditioner/heater in the office/lab is operated from a switch found on the front of the unit, and is controlled by a thermostat Adjust the heating and cooling of this unit as required for operator comfort

|                                   |              |                                       |
|-----------------------------------|--------------|---------------------------------------|
| EG&G ROCKY FLATS PLANT            | Manual       | RFP/ER 94 O&M OU 2 15                 |
| Draft OU2 Subsurface IM/RA        | Revision No  | Revision 0                            |
| Soil Vapor Extraction Pilot Unit  | Page         | 52 of 62                              |
| Operations and Maintenance Manual | Organization | Environmental Science and Engineering |

## 50 ALARMS AND AUTOMATIC SHUTDOWN

Alarm conditions are annunciated on the PanelAlarm located in the main control panel. Each alarm condition will activate the audible alarm and light the appropriate alarm indicator lamp in the PanelAlarm. Table 5 1 summarizes each alarm condition and action taken by the automatic controls of the PLC. The alarm horn is silenced by hitting the ALARM ACKNOWLEDGE button on the main control panel or at the remote EMERGENCY STOP station. After the alarm condition is cleared, hit the RESET button to clear the alarm light. If the alarm condition still exists, the alarm light will remain lighted. If the alarm condition has been cleared, the light will go out and the affected equipment will restart.

For all alarms in Table 5 1 except a FID alarm that say SYSTEM SHUTDOWN, a second RESET button is provided. This RESET is found on Page 7 of the graphic interface panel. For alarms initiated by the FID, the RESET is found on Page 2 of the graphic interface panel.

Table 5 2 presents the recommended setpoints for the system. Also shown are alarms which may be adjusted by operators and which alarms are part of the program itself.

**TABLE 5.1**  
**ALARMS**

| ALARM                                                  | CAUSE                                                                                                            |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| AAL-1001<br>Low Oxygen Level                           | LOW oxygen level detected in the process side<br>of the trailer<br><b>SYSTEM SHUTDOWN.</b>                       |
| AAH-1002<br>High Combustible Gas Level                 | HIGH combustible gas level detected in the<br>process side of the trailer<br><b>SYSTEM SHUTDOWN.</b>             |
| AAH-1003<br>High Combustible Gas Level                 | HIGH combustible gas level detected in the<br>process piping<br><b>SYSTEM SHUTDOWN.</b>                          |
| RAH-1004<br>High Radiation Level                       | HIGH radiation level detected in the process<br>piping vent to atmosphere<br><b>SYSTEM SHUTDOWN.</b>             |
| LSHH-120<br>D-120 Knockout Drum<br>High Level Exceeded | HIGH knockout drum liquid level Check pump<br>P-130 to ensure that it is working<br><b>B-300/B-500 SHUTDOWN.</b> |
| AAH-1005<br>Leak Detected                              | Leak detected on either the suction or discharge<br>piping of pump P-130<br><b>ALARM ONLY.</b>                   |
| TAH-300<br>Blower B-300 High<br>Output Temperature     | HIGH blower B-300 outlet temperature<br><b>B-300/B-500 SHUTDOWN.</b>                                             |
| TAH-500<br>Blower B-500 High<br>Output Temperature     | HIGH blower B-500 outlet temperature<br><b>B-300/B-500 SHUTDOWN.</b>                                             |
| TAH-600<br>Blower B-600 High<br>Output Temperature     | HIGH blower B-600 outlet temperature<br><b>B-600 SHUTDOWN.</b>                                                   |

| ALARM                                                                           | CAUSE                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAH-1000<br>Pressure Relief Actuated                                            | Process piping pressure has exceeded 5 psig<br>and one of the pressure relief valves has<br>actuated Note that this alarm can apply to any<br>of the three relief valves in the system<br><b>ALARM ONLY.</b> |
| FAL-1003<br>Low Flow                                                            | LOW flow has been detected across the in line<br>combustible gas monitor<br><b>ALARM ONLY.</b>                                                                                                               |
| LYHH-2201<br>T-2201 Storage Tank<br>High Level Exceeded                         | HIGH-HIGH level in ground water storage tank<br>T-2201<br><b>P-2/P-3/P-130 SHUTDOWN.</b>                                                                                                                     |
| LYHH-2202<br>T-2202 Storage Tank<br>High Level Exceeded                         | HIGH-HIGH level in ground water storage tank<br>T-2202<br><b>P-2/P-3/P-130 SHUTDOWN.</b>                                                                                                                     |
| AAH-1006A/B and AAHH-<br>1006A/B<br>High Organic Vapor<br>Concentration         | HIGH or HIGH-HIGH organic vapor<br>concentration in extracted vapor line or activated<br>carbon feed<br><b>ALARM ON HIGH, SYSTEM SHUTDOWN ON<br/>HIGH-HIGH.</b>                                              |
| TAH-400/410 and TAHH-<br>400/410<br>Activated Carbon Column High<br>Temperature | HIGH or HIGH-HIGH temperature in activated<br>carbon column T-400 or T-410<br><b>ALARM ON HIGH, SYSTEM SHUTDOWN ON<br/>HIGH-HIGH.</b>                                                                        |
|                                                                                 |                                                                                                                                                                                                              |

**TABLE 5.2**  
**SETPOINTS**

| Setpoint Designation | Description                          | Recommended Setting | Operator Adjustable |
|----------------------|--------------------------------------|---------------------|---------------------|
| TAH-300              | HIGH Discharge Temperature, B-300    | 300°F               | Yes, page 7         |
| TAH-500              | HIGH Discharge Temperature, B-500    | 300°F               | Yes, page 7         |
| LYH-120              | HIGH Knockout Drum Level             | 40%                 | Yes, page 4         |
| LYHH-120             | HIGH-HIGH Knockout Drum Level        | 60%                 | Yes, page 4         |
| LYL-120              | LOW Knockout Drum Level              | 20%                 | Yes, page 4         |
| TAH-400/410          | HIGH Temperature, any sensor         | 350°F               | Yes, page 7         |
| TAHH-400/410         | HIGH-HIGH Temperature, any sensor    | 450°F               | Yes, page 7         |
| TAH-600              | HIGH Temperature, B-600              | 300°F               | Yes, page 7         |
| LYH-2201             | HIGH Level, T-2201                   | 75%                 | Yes, page 4         |
| LYHH-2201            | HIGH-HIGH Level, T-2201              | 95%                 | Yes, page 4         |
| LYH-2202             | HIGH Level, T-2202                   | 75%                 | Yes, page 4         |
| LYHH-2202            | HIGH-HIGH Level, T-2202              | 95%                 | Yes, page 4         |
| LYL-2                | LOW Level, Extraction Well           | 40 feet             | Yes, page 5         |
| LYH-2                | HIGH Level, Extraction Well          | 30 feet             | Yes, page 5         |
| LYL-3                | LOW Level, Injection Well            | 40 feet             | Yes, page 5         |
| LYH-3                | HIGH Level, Injection Well           | 30 feet             | Yes, page 5         |
| AAL-1001             | LOW Oxygen Level, Trailer Atmosphere | 19.5%               | Yes, page 7         |

| Setpoint Designation | Description                                               | Recommended Setting | Operator Adjustable |
|----------------------|-----------------------------------------------------------|---------------------|---------------------|
| AAH-1002             | HIGH Combustible Gas Trailer Atmosphere                   | 10%                 | Yes, page 7         |
| AAH-1003             | HIGH Combustible Gas, Inline                              | 10%                 | Yes, page 7         |
| RAH-1004             | HIGH Radiation, Air Discharge                             | per EG&G            | Yes, Per EG&G       |
| LAH-1005             | LEAK Detected, Knockout Drum Liquid Transfer Piping       | none                | none                |
| AAH-1006A            | HIGH Extracted Vapor Organic Compound Concentration       | 10,000 ppm          | Yes, page 2         |
| AAHH-1006A           | HIGH-HIGH Extracted Vapor Organic Compound Concentration  | 15,000 ppm          | Yes, page 2         |
| AAH-1006B            | HIGH Activated Carbon Organic Compound Concentration      | 5,000 ppm           | Yes, page 2         |
| AAHH-1006B           | HIGH-HIGH Activated Carbon Organic Compound Concentration | 10,000 ppm          | Yes, page 2         |
|                      |                                                           |                     |                     |

## 6.0 MAINTENANCE REQUIREMENTS

Maintenance activities are limited to periodic servicing of the vacuum blowers (B-300, B-500, B-600), pumps, and calibration of some instruments. Each of these items are discussed in the following sections.

### 6.1 BLOWER MAINTENANCE

Blower maintenance requirements include periodic lubrication of bearings and oil changes. Blower lubrication should be performed every 500 hours and oil changes should be performed every 1,500 hours. Specific recommendations on frequency and lubrication products and procedures may be found in Section 3 of the blower operations and maintenance documentation provided in Appendix C.

### 6.2 INSTRUMENT CALIBRATION

Calibration requirements for each type of instrument are as shown in Table 6.1. Referenced manufacturers instructions may be found in Appendix C.

### 6.3 ELECTRIC MOTORS

The motors supplied on the blowers have regreasing capabilities and should be relubricated per the following guidelines:

| Hours of Service Per Year                              | Suggested Relube Interval     |                               |                               |
|--------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|
|                                                        | NEMA FRAME SIZE               |                               |                               |
|                                                        | 42 to 215T                    | 254 to 326T                   | 364 to 447T                   |
| 5000 Hrs                                               | 5 yrs                         | 3 yrs                         | 1 yr                          |
| Continuous Normal Usage                                | 2 yrs                         | 1 yr                          | 3 months                      |
| Seasonal Service<br>Motor is idle for 6 months or more | 1 yr<br>(beginning of season) | 1 yr<br>(beginning of season) | 1 yr<br>(beginning of season) |

The motors on pump P-130 and on the gas sampling cabinet exhaust blower should also be maintained per the above guidelines. Additional maintenance information on motors is provided in Table 6.2.

**TABLE 6.1**  
**INSTRUMENTATION CALIBRATION REQUIREMENTS**

| Instrument Identification                                             | Calibration Frequency | Comments                                                                                                                       |
|-----------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Pressure Gauges PI-130                                                | Yearly                | Requires removal from system                                                                                                   |
| Pressure Transmitters PT-100,110,200,201, 300,400,410,500,600         | N/A                   | Factory calibrated, no periodic recalibration required                                                                         |
| Differential Pressure Gauges PDI-200,201, 210,211,220,221             | Yearly                | Requires removal from system                                                                                                   |
| Level Transmitters LT-120, LT-2, LT-3                                 | Yearly                | Recalibrate per manufacturers instructions                                                                                     |
| Flow Transmitters FE-100,110,500                                      | N/A                   | Factory calibrated Requires special equipment to calibrate in field If problems suspected, return to factory for recalibration |
| Temperature Transmitters TT-500,600                                   | Six months            | Recalibrate per manufacturers instructions                                                                                     |
| Temperature and Relative Humidity Transmitters MT/TT-100,110, 200,300 | Six months            | Recalibrate per manufacturers instructions                                                                                     |
| Oxygen Sensor AE-1001                                                 | Quarterly             | Recalibrate per manufacturers instructions                                                                                     |
| Combustible Gas Sensors AE-1002,1003                                  | Quarterly             | Recalibrate per manufacturers instructions                                                                                     |
| Radiation Monitor RAH-1004                                            | per EG&G              | Per EG&G Standard Operating Procedures                                                                                         |
| Leak Detection System LS-1005                                         | N/A                   | No calibration required                                                                                                        |

**TABLE 6.2**  
**MAINTENANCE SCHEDULE**

|                                            | Frequency |      |       |         |         |      |        |
|--------------------------------------------|-----------|------|-------|---------|---------|------|--------|
|                                            | Day       | Week | Month | 3 Month | 6 Month | Year | Vendor |
| <b>Blowers</b>                             |           |      |       |         |         |      |        |
| General                                    |           |      |       |         |         |      |        |
| Check for unknown vibrations or noises     | *         |      |       |         |         |      |        |
| Check discharge pressures                  | *         |      |       |         |         |      |        |
| Check belts and motor for alignment        |           |      |       | *       |         |      |        |
| Blower Bearings                            |           |      |       |         |         |      |        |
| Check bearing temperature                  | *         |      |       |         |         |      |        |
| Lubricate blower bearings                  |           |      |       |         |         |      | *      |
| Change blower bearing oil                  |           |      |       |         |         |      | *      |
| Motors                                     |           |      |       |         |         |      |        |
| Lubricate motor bearings                   |           |      |       |         |         |      | *      |
| <b>Kneadout Drive Pump</b>                 |           |      |       |         |         |      |        |
| General                                    |           |      |       |         |         |      |        |
| Check for unknown vibrations or noises     | *         |      |       |         |         |      |        |
| Motor                                      |           |      |       |         |         |      |        |
| Lubricate motor bearings                   |           |      |       |         |         |      | *      |
| <b>Gas Sampling Cabinet Exhaust Blower</b> |           |      |       |         |         |      |        |
| General                                    |           |      |       |         |         |      |        |
| Check for unknown vibrations or noises     | *         |      |       |         |         |      |        |
| Motor                                      |           |      |       |         |         |      |        |
| Lubricate motor bearings                   |           |      |       |         |         |      | *      |

## 70 RESPONSE TO SYSTEM UPSETS

The following sections provide basic troubleshooting information for problems not related to normal operations of the system

**Problem:** Low trailer oxygen alarm

**Response:** Upon alarm annunciation immediately evacuate the trailer and notify Rocky Flats Plant Industrial Hygiene personnel. Entry back into the trailer shall only take place after monitoring confirms adequate oxygen levels, or if self-contained breathing apparatus is used. Possible causes of such an alarm include a piping leak in a vacuum line or a sensor malfunction. A piping leak would not likely cause such a problem unless it was significant as there are several louvers and fans which supply air to the inside of the trailer.

**Problem:** High combustible gas alarm

**Response:** Upon alarm annunciation immediately evacuate trailer and notify Rocky Flats Plant Fire Department. Entry back into the trailer shall only take place after monitoring confirms that the danger is passed. Possible causes of the alarm include presence of an actual combustible gas mixture or a sensor malfunction.

**Problem:** Fire

**Response:** Immediately evacuate trailer and notify Rocky Flats Plant Fire Department. If fire is small and localized, and does not involve any materials which could release hazardous or radioactive compounds, portable fire extinguishers may be used to put the fire out. If there is any uncertainty as to the ability to put out the fire, do not make the attempt.

**Problem:** Knockout Drum drain line leak as annunciated by LAH-1005

**Response:** If the system is in the middle of a critical operation, the operation may continue as the drain line is double contained. A drain valve is provided to periodically drain the leaked fluid.

Two leak detector boxes are installed in the back of the trailer. One box monitors the pump suction line, and the other the pump discharge line. Inspect the boxes to determine which section of pipe contains the leak. This section can then be replaced.

**Problem:** Failure of interlocks to operate equipment in proper sequence

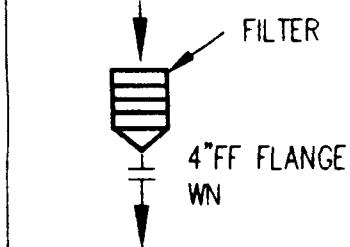
**Response:** The PLC program may have been corrupted. Shut down the system and advise a qualified programmer. Program documentation is provided in Appendix B.

**Problem:** Piece of rotating equipment does not start

**Response:** Verify that all conditions necessary for equipment start are met. If so, potential sources of the problem include a corrupted PLC program or an electrical problem. Verify that all circuit breakers and motor protection devices (i.e. heaters) are functioning properly. If these are okay, a continuity check can be run on the motor feeders. If these are okay, notify a qualified programmer to identify potential PLC programming problems.

**Problem:** Radiation alarm goes off

**Response:** Shut down the system and notify EG&G Radiation Protection personnel immediately. Potential sources of the problem include an actual release of radioactive materials or an equipment malfunction.



NOTES

ALL PIPING, WIRING, AND COMPONENTS LOCATED OUTSIDE  
OF THE TRAILER ARE PROVIDED AND INSTALLED BY OTHERS  
(EXCEPT INSTRUMENTATION AS NOTED)

FLANGE TYPE DESIGNATIONS

FF - FLAT FACE  
RF - RAISED FACE  
WN - WELD NECK  
SO - SLIP ON

BLDG/  
FACIL  
N/A

Cont. Sys

H

Hdg-vent

A

Arch

G

Gr. Box

E

Elec

D

Detection

M

Mech

T

Int

B

Building

C

Civil

U

Utilities

P

Piping

W

Fire Prot

L

Layouts

F

Flow Drag

S

Stds

X

Alarms

TO TANK TRUCK

| B                                                               |                |          |             |         |                |     |          |        |        |
|-----------------------------------------------------------------|----------------|----------|-------------|---------|----------------|-----|----------|--------|--------|
| A                                                               | ORIGINAL ISSUE |          |             | 8/30/93 | JKG            | RPA | APPV KMC |        | 930153 |
| ISSUE                                                           | DESCRIPTION    |          |             | DATE    | RFP            | DOE | CLASS    | JOB NO |        |
| WORDS                                                           | TOLERANCES     | BY       | DATE        |         |                |     |          |        |        |
| POR                                                             | FRAC           | DESIGNED | J.K. GARROD | 6/15/93 |                |     |          |        |        |
| TRACTION                                                        | ANGLE          | DRAWN    | R.R. RANES  | 6/15/93 |                |     |          |        |        |
| IT                                                              | DEC            | CHECKED  | AP GANGEM   | 6/15/93 |                |     |          |        |        |
| dD                                                              | XXX            | APPROVED | K.W. CONROY | 6/15/93 |                |     |          |        |        |
| MBOLS                                                           | XX             |          |             |         |                |     |          |        |        |
| G / FACILITY                                                    | UNLESS NOTED   |          |             |         |                |     |          |        |        |
|                                                                 | OTHERWISE      |          |             |         |                |     |          |        |        |
|                                                                 | REMOVE BURRS   |          |             |         |                |     |          |        |        |
|                                                                 | AND            |          |             |         |                |     |          |        |        |
|                                                                 | SHARP EDGES    |          |             |         |                |     |          |        |        |
|                                                                 | NEXT ASSEMBLY  |          |             |         |                |     |          |        |        |
|                                                                 | SUBMITTED      |          |             | SIZE    | DRAWING NUMBER |     | ISSUE    | SHEET  |        |
| ASTER                                                           | SCALE          | APPV RFP |             | D       | 401            |     |          | OF     |        |
| <input type="checkbox"/> NO <input checked="" type="checkbox"/> | NONE           | APPV DOE |             |         |                |     |          |        |        |

AUTOCAD REL.11 GENERATED DRAWING  
NO MANUAL CHANGES ALLOWED

G SYSTEM

INSIDE TRAILER      OUTSIDE TRAILER

|            |
|------------|
| BLDC/FACIL |
| N/A        |
| Cont Sys   |
| H          |
| Htg-vent   |
| A          |
| Arch       |
| G          |
| GL Box     |
| E          |
| Elec       |
| D          |
| Detection  |
| M          |
| Mech       |
| I          |
| Inst       |
| B          |
| Building   |
| C          |
| Civil      |
| U          |
| Utilities  |
| P          |
| Piping     |
| W          |
| Fire Prot  |
| L          |
| Layouts    |
| F          |
| Flow Dwg   |
| S          |
| Stds       |
| X          |
| Alarms     |

|                                 |                |             |                          |                                          |         |         |        |        |  |
|---------------------------------|----------------|-------------|--------------------------|------------------------------------------|---------|---------|--------|--------|--|
| B                               |                |             |                          |                                          |         |         |        |        |  |
| A                               | ORIGINAL ISSUE |             |                          | 8/30/93                                  | JKG RFP | APPV MC | 930153 |        |  |
| ISSUE                           | DESCRIPTION    |             |                          | DATE                                     | RFP     | DOE     | CLASS  | JOB NO |  |
| TOLERANCES                      | BY             | DATE        | U S DEPARTMENT OF ENERGY |                                          |         |         |        |        |  |
| TRAC                            | DESIGNED       | J.K. GARROD | 6/15/93                  | ROCKY FLATS AREA OFFICE GOLDEN, COLORADO |         |         |        |        |  |
| ANGLE                           | DRAWN          | R.R. RANES  | 6/15/93                  | ROCKY FLATS PLANT                        |         |         |        |        |  |
| DEC                             | CHECKED        | A.P. GANGEM | 6/15/93                  | Golden Colorado 80402-0464               |         |         |        |        |  |
| XXX                             | APPROVED       | K.W. CONROY | 6/15/93                  | MOBILE SOIL VAPOR                        |         |         |        |        |  |
| XX                              |                |             |                          | EXTRACTION PILOT PLANT                   |         |         |        |        |  |
| UNLESS NOTED                    |                |             |                          | P & ID                                   |         |         |        |        |  |
| OTHERWISE                       |                |             |                          |                                          |         |         |        |        |  |
| REMOVE BURRS<br>AND SHARP EDGES |                |             |                          |                                          |         |         |        |        |  |
| NEXT ASSEMBLY                   | SUBMITTED      |             | SIZE                     | DRAWING NUMBER                           |         | ISSUE   | SHEET  |        |  |
| SCALE                           | APPV RFP       |             | D                        | 402                                      |         |         | OF     |        |  |
| NONE                            | APPV DOE       |             |                          |                                          |         |         |        |        |  |

AUTOCAD REL.11 GENERATED DRAWING  
NO MANUAL CHANGES ALLOWED

Configuration File EGGVAP PC1

| Page No | Password Protection | Page Title                             |
|---------|---------------------|----------------------------------------|
| 0       | NONE                | Inlet Conditions                       |
| 1       | NONE                | System Temperatures & Information      |
| 2       | NONE                | FID Information                        |
| 3       | NONE                | Blower Control & Blower Discharge Data |
| 4       | NONE                | Pump Control & Tank Levels             |
| 5       | NONE                | Well Information                       |
| 6       | NONE                | Timers                                 |
| 7       | NONE                | System Alarms and Setpoints            |
| 8       | NONE                |                                        |
| 9       | NONE                |                                        |

/--PI-100--\ /--FI-100--\ /--FQ-100--\ /--MI-100--\ /--TI-100--\  
1 2 3 4 5 1 2 3 4 5 6 1 2 3 4 5 6 1 2 3 4 5 1 2 3 4 5

\-inches Hg/ \-----SCFM/ \>-1000 SCF/ \-----%RH/ \-----deg F/

/--PI-110--\ /--FI-110--\ /--FQ-110--\ /--MI-110--\ /--TI-110--\  
1 2 3 4 5 1 2 3 4 5 6 1 2 3 4 5 6 1 2 3 4 5 1 2 3 4 5

\-inches Hg/ \-----SCFM/ \>-1000 SCF/ \-----%RH/ \-----deg F/

## READOUT TEMPLATE

```
/--PI-100--\
```

```
| 1 2 3 4 5 |
```

```
\-inches Hg/
```

Template Base Cell 1

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

Device Name PI-100

Units inches Hg

Value 1 Expression [B B 1]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/--FI-100--\

1 2 3 4 5 6

\-----SCFM/

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name FI-100

Units SCFM

Value 1 Expression [B B 26]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/---FQ-100--\

1 2 3 4 5 6

\&gt;-1000 SCF/

Template Base Cell 3

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name FQ-100

Units 1000 SCF

Value 1 Expression [B B 32]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type BUTTON

## CONTROL BUTTON DEFINITION TABLE

FG BG B      Control Label      PLC Bit Reference

1 HI NO N

2 HI NO N Reset      [I 31/10]

3 HI NO N

4 HI NO N

## READOUT TEMPLATE

/-MI-100-\

1 2 3 4 5

Template Base Cell 4

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----%RH/

Device Name MI-100

Units %RH

Value 1 Expression [B B 21]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

\_ADOUT TEMPLATE

/--TI-100--\

1 2 3 4 5

Template Base Cell 5

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\----deg F/

Device Name TI-100

Units deg F

Value 1 Expression [B B 20]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/--PI-110--\
```

```
| 1 2 3   4 5 |
```

```
\-inches Hg/
```

Template Base Cell 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

Device Name PI-110

Units inches Hg

Value 1 Expression [B B 3]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/--FI-110--\

1 2 3 4 5 6

Template Base Cell 7

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

\-----SCFM/

Device Name FI-110

Units SCFM

Value 1 Expression [B B 46]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

**READOUT TEMPLATE**  
/ --FQ-110-- \

\>-1000 SCF,

Template Base Cell 8

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                            0

Device Name FQ-110

Units 1000 SCF

Value 1 Expression [B B 35]

## Value 2 Expression

## High Alarm Expression

## Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

### Alarm Acknowledgment Y

**Control Type    BUTTON**

## CONTROL BUTTON DEFINITION TABLE

| CONTROL BUTTON DEFINITION TABLE |               |                   |
|---------------------------------|---------------|-------------------|
| FG BG B                         | Control Label | PLC Bit Reference |
| 1 HI NO N                       |               |                   |
| 2 HI NO N                       | Reset         | [I 31/11]         |
| 3 HI NO N                       |               |                   |
| 4 HI NO N                       |               |                   |

## READOUT TEMPLATE

```
/--MI-110--\\
|          |
1 2 3 4 5
\-----%RH/
```

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name MI-110

Units %RH

Value 1 Expression [B B 23]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/--TI-110--\

1 2 3 4 5

Template Base Cell 10

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            1

\-----deg F/

Device Name TI-110

Units deg F

Value 1 Expression [B B 22]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

/--PI-200--\ /--PI-201--\ /--PI-400--\ /--PI-410--\  
| 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 |  
\-inches Hg/ \-inches Hg/ \-inches Hg/ \-inches Hg/  
/--MI-200--\ /-TI-400A--\ /-TI-400B--\ /-TI-400C--\  
| 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 |  
\-----%RH/  
/--TI-200--\ /-TI-410A--\ /-TI-410B--\ /-TI-410C--\  
| 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 | | 1 2 3 4 5 |  
\-----deg F/ \-----deg F/ \-----deg F/ \-----deg F/

## READOUT TEMPLATE

/---PI-200---\

1 2 3 4 5  
\-inches Hg/

Template Base Cell 1

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

Device Name PI-200

Units inches Hg

Value 1 Expression [B B 4]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-PI-201-\

1 2 3 4 5

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

\-inches Hg/

Device Name PI-201

Units inches Hg

Value 1 Expression [B B 5]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/---PI-400---\

1 2 3 4 5

\-inches Hg/

Template Base Cell 3

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

Device Name PI-400

Units inches Hg

Value 1 Expression [B B 7]/100

Value 2 Expression

High Alarm Expression

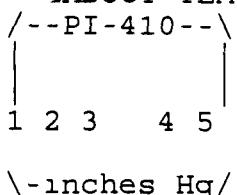
Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE



Template Base Cell 4

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                        2

Device Name PI-410

Units inches Hg

Value 1 Expression [B B 10]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-MI-200-\

1 2 3 4 5

Template Base Cell 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----%RH/

Device Name MI-200

Units %RH

Value 1 Expression [B B 41]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-400A--\

1 2 3 4 5

Template Base Cell 8

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----deg F/

Device Name TI-400A

Units deg F

Value 1 Expression [B B 50]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-400B--\

1 2 3 4 5

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----deg F/

Device Name TI-400B

Units deg F

Value 1 Expression [B B 51]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-400C--\

1 2 3 4 5

Template Base Cell 10

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----deg F/

Device Name TI-400C

Units deg F

Value 1 Expression [B B 52]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/--TI-200--\\
|           |
1 2 3 4   5
\----deg F/
```

Template Base Cell 11

Template Size/Character Size Decimal Places  
NORMAL / QUAD 1

Device Name TI-200

Units deg F

Value 1 Expression [B B 40]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-410A--\

1 2 3 4 5

\-----deg F/

Template Base Cell 13

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name TI-410A

Units deg F

Value 1 Expression [B B 53]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-410B--\

1 2 3 4 5

Template Base Cell 14

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----deg F/

Device Name TI-410B

Units deg F

Value 1 Expression [B B 54]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-410C--\

1 2 3 4 5

\----deg F/

Template Base Cell 15

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name TI-410C

Units deg F

Value 1 Expression [B B 55]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

|                                   |            |             |
|-----------------------------------|------------|-------------|
| /---FID---                        | /---FID--- | /--Alarm--- |
| 1 2 3 4 5 6     Select     Status |            |             |
| \--1000 ppm/ \-----/ \-----/      |            |             |
| /AAH-1006A-  /AAH-1006B-          |            |             |
| Set Point   Set Point             |            |             |
| 1 2 3 4 5 6     1 2 3 4 5 6       |            |             |
| \>-1000 ppm/ \>-1000 ppm/         |            |             |
| /AAHH-1006A  /AAHH-1006B          |            |             |
| Set Point   Set Point             |            |             |
| 1 2 3 4 5 6     1 2 3 4 5 6       |            |             |
| ` -1000 ppm/ \>-1000 ppm/         |            |             |

## READOUT TEMPLATE

```
/---FID---\  
| 1 2 3 4 5 6 |  
\--1000 ppm/
```

Template Base Cell 1

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                        0

Device Name      FID

Units 1000 ppm

Value 1 Expression [B B 47]

Value 2 Expression

High Alarm Expression

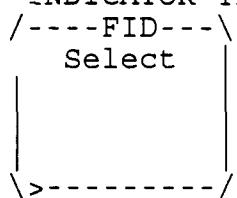
Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## --INDICATOR TEMPLATE



Template Base Cell 2

Template Size      Character Size  
NORMAL            NORMAL

Device Name      FID\_      Select

A A  
l c  
m k

## TEMPLATE DEFINITION TABLE

FG BG B      Template Label      Conditional Expression

1 HI NO N Extracted\_Vapor      [O 31/07]      N Y

2 HI NO N      N Y

3 HI NO N      N Y

4 HI NO N      N Y

HI NO N      GAC\_      Feed      1      N Y

## CONTROL BUTTON DEFINITION TABLE

FG BG B      Control Label      PLC Bit Reference

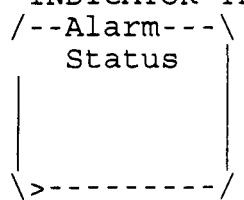
1 HI NO N

2 HI NO N Select\_Extracted\_Vapor      [I 31/16]

3 HI NO N Select\_GAC Feed      [I 31/17]

4 HI NO N

## INDICATOR TEMPLATE



Template Base Cell 3

Template Size Character Size  
NORMAL NORMAL

Device Name Alarm\_ Status

| FG BG B   | Template Label      | Conditional Expression | A A<br>l c<br>m k |
|-----------|---------------------|------------------------|-------------------|
| 1 NO HI Y | High VOC_ Shut Down | [O 31/10]              | N Y               |
| 2 NO HI Y | High VOC_ Alarm     | [O 31/11]              | N Y               |
| 3 HI NO N |                     |                        | N Y               |
| 4 HI NO N |                     |                        | N Y               |
| HI NO N   |                     |                        | N Y               |

## CONTROL BUTTON DEFINITION TABLE

| FG BG B   | Control Label | PLC Bit Reference |
|-----------|---------------|-------------------|
| 1 HI NO N |               |                   |
| 2 HI NO N | Reset Alarm   | [I 32/00]         |
| 3 HI NO N |               |                   |
| 4 HI NO N |               |                   |

## READOUT TEMPLATE

/AAH-1006A-\

Set Point |

1 2 3 4 5 6

\&gt;-1000 ppm/

Template Base Cell 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name AAH-1006A\_ Set Point

Units 1000 ppm

Value 1 Expression [B A 24]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 24]

Password Protection A ONLY

## READOUT TEMPLATE

/AAH-1006B-\

Set Point |

1 2 3 4 5 6

\&gt;-1000 ppm/

Template Base Cell 7

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            0

Device Name AAH-1006B\_Set Point

Units 1000 ppm

Value 1 Expression [B A 26]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 26]

Password Protection A ONLY

## READOUT TEMPLATE

/AAHH-1006A\

Set Point

1 2 3 4 5 6

Template Base Cell 11

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

\&gt;-1000 ppm/

Device Name AAHH-1006A\_Set Point

Units 1000 ppm

Value 1 Expression [B A 25]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 25]

Password Protection A ONLY

## READOUT TEMPLATE

/AAHH-1006B\

Set Point |

Template Base Cell 12

1 2 3 4 5 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                                    0

\&gt;-1000 ppm/

Device Name AAHH-1006B\_ Set Point

Units 1000 ppm

Value 1 Expression [B A 27]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 27]

Password Protection A ONLY

/--B-300---\ /--PI-300--\ /--TI-300--\ /--MI-300--\  
| | | |  
| 1 2 3 4 5 | 1 2 3 4 5 | 1 2 3 4 5 | 1 2 3 4 5 |  
\>-----/ \-----inches Hg/ \-----deg F/ \-----%RH/  
/--B-500---\ /--PI-500--\ /--TI-500--\ /--FI-500--\ /--FQ-500--\  
| | | | |  
| 1 2 3 4 5 | 1 2 3 4 5 | 1 2 3 4 5 6 | 1 2 3 4 5 6 |  
\>-----/ \-----psig/ \-----deg F/ \-----SCFM/ \>-1000 SCF/  
/--B-600---\ /--PI-600--\ /--TI-600--\  
| | |  
| 1 2 3 4 5 | 1 2 3 4 5 |  
\>-----/ \-----psig/ \-----deg F/

## INDICATOR TEMPLATE

```
/--B-300--\\>-----/
```

Template Base Cell 1

Template Size Character Size  
NORMAL NORMAL

Device Name B-300

## TEMPLATE DEFINITION TABLE

| FG BG B   | Template Label   | Conditional Expression | A A<br>l c<br>m k |
|-----------|------------------|------------------------|-------------------|
| 1 HI NO Y | Alarm            | [O 30/00]              | N Y               |
| 2 HI LO N | On               | [O 30/01]              | N Y               |
| 3 NO MD N | Timed_ Operation | [O 30/02]              | N Y               |
| 4 NO MD N | Auto_ Operation  | [O 30/03]              | N Y               |
| HI NO N   | Off              | 1                      | N Y               |

## CONTROL BUTTON DEFINITION TABLE

| FG BG B   | Control Label        | PLC Bit Reference |
|-----------|----------------------|-------------------|
| 1 HI NO N | Off                  | [I 30/00]         |
| 2 HI NO N | On                   | [I 30/01]         |
| 3 HI NO N | Automatic_ Operation | [I 30/02]         |
| 4 HI NO N | Timed_ Operation     | [I 30/03]         |

## READOUT TEMPLATE

/-PI-300--\

1 2 3 4 5

\-inches Hg/

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        2

Device Name PI-300

Units inches Hg

Value 1 Expression [B B 6]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-TI-300-\

1 2 3 4 5

\-----deg F/

Template Base Cell 3

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name      TI-300

Units    deg F

Value 1 Expression [B B 24]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

--MI-300--

1 2 3 4 5

Template Base Cell 4

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\-----%RH/

Device Name MI-300

Units %RH

Value 1 Expression [B B 25]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## INDICATOR TEMPLATE

```

/--B-500--\
|           |
|           |
\----->

```

Template Base Cell 6

Template Size Character Size  
NORMAL NORMAL

Device Name B-500

## TEMPLATE DEFINITION TABLE

| FG BG B   | Template Label   | Conditional Expression | A A<br>l c<br>m k |
|-----------|------------------|------------------------|-------------------|
| 1 HI NO Y | Alarm            | [O 30/04]              | N Y               |
| 2 HI LO N | On               | [O 30/05]              | N Y               |
| 3 NO MD N | Timed_ Operation | [O 30/06]              | N Y               |
| 4 NO MD N | Auto_ Operation  | [O 30/07]              | N Y               |
| HI NO N   | Off              | 1                      | N Y               |

## CONTROL BUTTON DEFINITION TABLE

| FG BG B   | Control Label        | PLC Bit Reference |
|-----------|----------------------|-------------------|
| 1 HI NO N | Off                  | [I 30/04]         |
| 2 HI NO N | On                   | [I 30/05]         |
| 3 HI NO N | Automatic_ Operation | [I 30/06]         |
| 4 HI NO N | Timed_ Operation     | [I 30/07]         |

.--READOUT TEMPLATE

/--PI-500--\

1 2 3 4 5  
\\-----psig/

Template Base Cell 7

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                        2

Device Name PI-500

Units psig

Value 1 Expression [B B 11]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/--TI-500--\  
| 1 2 3 4 5 |  
\-----deg F/
```

Template Base Cell 8

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name      TI-500

Units      deg F

Value 1 Expression [B B 13]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/--FI-500--\\
 1 2 3 4 5 6
\-----SCFM/
```

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name      FI-500

Units      SCFM

Value 1 Expression [B B 27]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/--FQ-500--\

1 2 3 4 5 6

\&gt;-1000 SCF/

Template Base Cell 10

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name FQ-500

Units 1000 SCF

Value 1 Expression [B B 33]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type BUTTON

## CONTROL BUTTON DEFINITION TABLE

FG BG B      Control Label      PLC Bit Reference

1 HI NO N

2 HI NO N Reset      [I 31/12]

3 HI NO N

4 HI NO N

## INDICATOR TEMPLATE

```

  /--B-600--\
  |           |
  |           |
  \>-----/

```

Template Base Cell 11

Template Size      Character Size  
NORMAL            NORMAL

Device Name      B-600

## TEMPLATE DEFINITION TABLE

| FG BG B   | Template Label   | Conditional Expression | A A<br>l c<br>m k |
|-----------|------------------|------------------------|-------------------|
| 1 HI NO Y | Alarm            | [O 30/10]              | N Y               |
| 2 HI LO N | On               | [O 30/11]              | N Y               |
| 3 NO MD N | Timed_ Operation | [O 30/12]              | N Y               |
| 4 NO MD N | Auto_ Operation  | [O 30/13]              | N Y               |
| HI NO N   | Off              | 1                      | N Y               |

## CONTROL BUTTON DEFINITION TABLE

| FG BG B   | Control Label        | PLC Bit Reference |
|-----------|----------------------|-------------------|
| 1 HI NO N | Off                  | [I 30/10]         |
| 2 HI NO N | On                   | [I 30/11]         |
| 3 HI NO N | Automatic_ Operation | [I 30/12]         |
| 4 HI NO N | Timed_ Operation     | [I 30/13]         |

## READOUT TEMPLATE

/---PI-600---

1 2 3 4 5

Template Base Cell 12

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            2

\-----psig/

Device Name PI-600

Units psig

Value 1 Expression [B B 14]/100

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/--TI-600--\
```

```
| 1 2 3 4 5 |
```

```
\----deg F/
```

Template Base Cell 13

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                        1

Device Name      TI-600

Units    deg F

Value 1 Expression [B B 15]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

|             |              |              |              |              |
|-------------|--------------|--------------|--------------|--------------|
| /--P-130--\ | /--LI-120--\ | /-LYL-120--\ | /-LYH-120--\ | /-LYHH-120-\ |
|             |              | Set Point    | Set Point    | Set Point    |
|             | 1 2 3 4 5    | 1 2 3 4 5    | 1 2 3 4 5    | 1 2 3 4 5    |
| \>-----/    | \-----%/     | \>-----%/    | \>-----%/    | \>-----%/    |
|             | /--LI-2201-\ | /-LYH-2201-\ | /-LYHH-2201\ |              |
|             |              | Set Point    | Set Point    |              |
|             | 1 2 3 4 5    | 1 2 3 4 5    | 1 2 3 4 5    |              |
|             | \-----%/     | \-----%/     | \-----%/     |              |
|             | /--LI-2202-\ | /-LYH-2202-\ | /-LYHH-2202\ |              |
|             |              | Set Point    | Set Point    |              |
|             | 1 2 3 4 5    | 1 2 3 4 5    | 1 2 3 4 5    |              |
|             | \-----%/     | \-----%/     | \-----%/     |              |

## INDICATOR TEMPLATE

--P-130-->-----

Template Base Cell 1

Template Size Character Size  
NORMAL NORMAL

Device Name P-130

A A  
l c  
m k

## TEMPLATE DEFINITION TABLE

| FG BG B   | Template Label | Conditional Expression | A A<br>l c<br>m k |
|-----------|----------------|------------------------|-------------------|
| 1 HI NO Y | Alarm          | [O 30/14]              | N Y               |
| 2 HI LO N | On             | [O 30/15]              | N Y               |
| 3 NO MD N | Auto           | [O 30/16]              | N Y               |
| 4 HI NO N |                |                        | N Y               |
| HI NO N   | Off            | 1                      | N Y               |

## CONTROL BUTTON DEFINITION TABLE

Control Label PLC Bit Reference

|                          |           |
|--------------------------|-----------|
| 1 HI NO N Off            | [I 30/14] |
| 2 HI NO N On             | [I 30/15] |
| 3 HI NO N Start          | [I 30/16] |
| 4 HI NO N Auto_Operation | [I 30/17] |

## READOUT TEMPLATE

```
/--LI-120--\\
|           |
|           |
1 2 3 4   5
\-----%/
```

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name      LI-120

Units   %

Value 1 Expression [B B 16]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-LYL-120--\

Set Point |

1 2 3 4 5

Template Base Cell 3

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                          1

\&gt;-----%/

Device Name LYL-120 Set Point

Units %

Value 1 Expression [B A 12]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 12]

Password Protection A ONLY

## READOUT TEMPLATE

/-LYH-120--\

Set Point |

1 2 3 4 5

Template Base Cell 4

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\&gt;-----%/

Device Name LYH-120\_ Set Point

Units %

Value 1 Expression [B A 11]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 11]

Password Protection A ONLY

## READOUT TEMPLATE

/-LYHH-120-\

Set Point |

1 2 3 4 5

Template Base Cell 5

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                          1

\&gt;-----%/

Device Name LYHH-120\_ Set Point

Units %

Value 1 Expression [B A 2]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 2]

Password Protection A ONLY

READOUT TEMPLATE  
/-LI-2201-\  
| 1 2 3 4 5 |  
\-----%/  
Template Base Cell 7  
Template Size/Character Size Decimal Places  
NORMAL / QUAD 1  
Device Name LI-2201  
Units %  
Value 1 Expression [B B 0]/10  
Value 2 Expression  
High Alarm Expression  
Low Alarm Expression  
Deadband Range 0 % of (High Alarm - Low Alarm)  
Alarm Acknowledgment Y  
Control Type NONE

## READOUT TEMPLATE

/-LYH-2201-\

Set Point

1 2 3 4 5

Template Base Cell 8

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\&gt;-----%/

Device Name LYH-2201\_Set Point

Units %

Value 1 Expression [B A 3]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 3]

Password Protection A ONLY

## READOUT TEMPLATE

/-LYHH-2201\

Set Point

1 2 3 4 5

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                          1

\&gt;-----%/

Device Name LYHH-2201 Set Point

Units %

Value 1 Expression [B A 4]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 4]

Password Protection A ONLY

## READOUT TEMPLATE

```
/--LI-2202-\n| 1 2 3 4 5\n\-----%/
```

Template Base Cell 12

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name LI-2202

Units %

Value 1 Expression [B B 2]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## ..ADOUT TEMPLATE

/-LYH-2202-\

Set Point |

1 2 3 4 5

Template Base Cell 13

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            1\>-----%/  
  
Device Name LYH-2202\_Set Point

Units %

Value 1 Expression [B A 20]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 20]

Password Protection A ONLY

## READOUT TEMPLATE

/-LYHH-2202\

Set Point

Template Base Cell 14

1 2 3 4 5

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            1\>-----%/  
  
Device Name LYHH-2202\_ Set Point

Units %

Value 1 Expression [B A 21]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

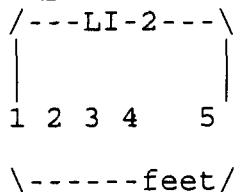
Input Value Expression [?] \*10

Target Word Address [B A 21]

Password Protection A ONLY

|              |                |                |              |
|--------------|----------------|----------------|--------------|
| /---P-2---   | \ /-SV1-Well-\ | / SV1-Casing \ | /---LI-2---  |
| Pressure     | Pressure       | Pressure       | Pressure     |
| 1 2 3 4 5    | 1 2 3 4 5      | 1 2 3 4 5      | 1 2 3 4 5    |
| \>-----/     | \--feet H2O/   | \--feet H2O/   | \-----feet/  |
| /---P-3---   | \ /-SI1-Well-\ | / SI1-Casing \ | /---LI-3---  |
| Pressure     | Pressure       | Pressure       | Pressure     |
| 1 2 3 4 5    | 1 2 3 4 5      | 1 2 3 4 5      | 1 2 3 4 5    |
| \>-----/     | \--feet H2O/   | \--feet H2O/   | \-----feet/  |
| /--LYL-2---  | \ --LYH-2---   | /---LYL-3--\   | /--LYH-3---  |
| Set Point    | Set Point      | Set Point      | Set Point    |
| 1 2 3 4 5    | 1 2 3 4 5      | 1 2 3 4 5      | 1 2 3 4 5    |
| \>-----feet/ | \>-----feet/   | \>-----feet/   | \>-----feet/ |

## READOUT TEMPLATE



Template Base Cell 4

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name      LI-2

Units   feet

Value 1 Expression [B B 56]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

READOUT TEMPLATE

/SV1-Casing\

| Pressure |  
1 2 3 4 5

Template Base Cell 3

\--feet H2O/

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            1

Device Name SV1 Casing\_ Pressure

Units feet H2O

Value 1 Expression [B B 42]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-SV1-Well-\

Pressure

1 2 3 4 5

\--feet H2O/

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name SV1 Well\_ Pressure

Units feet H2O

Value 1 Expression [B B 43]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

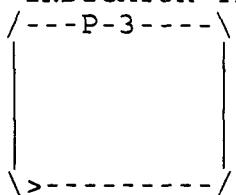
Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

| INDICATOR TEMPLATE              |                |                         |                          |
|---------------------------------|----------------|-------------------------|--------------------------|
| P-2                             |                | Template Base Cell 1    |                          |
|                                 |                | Template Size<br>NORMAL | Character Size<br>NORMAL |
|                                 |                | Device Name<br>P-2      | A A                      |
| TEMPLATE DEFINITION TABLE       |                |                         |                          |
| FG BG B                         | Template Label | Conditional Expression  | A A<br>l c<br>m k        |
| 1 HI LO N                       | On             | [O 31/00]               | N Y                      |
| 2 NO MD N                       | Auto           | [O 31/01]               | N Y                      |
| 3 HI NO N                       |                |                         | N Y                      |
| 4 HI NO N                       |                |                         | N Y                      |
| HI NO N                         | Off            | 1                       | N Y                      |
| CONTROL BUTTON DEFINITION TABLE |                |                         |                          |
| FG BG B                         | Control Label  | PLC Bit Reference       |                          |
| 1 HI NO N Off                   |                | [I 31/00]               |                          |
| 2 HI NO N On                    |                | [I 31/01]               |                          |
| 3 HI NO N Start                 |                | [I 31/14]               |                          |
| 4 HI NO N Auto_Operation        |                | [I 31/02]               |                          |

## INDICATOR TEMPLATE



Template Base Cell 6

Template Size Character Size  
NORMAL NORMAL

Device Name P-3

A A  
l c  
m k

## TEMPLATE DEFINITION TABLE

| FG BG B   | Template Label | Conditional Expression |     |
|-----------|----------------|------------------------|-----|
| 1 HI LO N | On             | [O 31/03]              | N Y |
| 2 NO MD N | Auto           | [O 31/04]              | N Y |
| 3 HI NO N |                |                        | N Y |
| 4 HI NO N |                |                        | N Y |
| HI NO N   | Off            | 1                      | N Y |

## CONTROL BUTTON DEFINITION TABLE

| FG BG B   | Control Label  | PLC Bit Reference |
|-----------|----------------|-------------------|
| 1 HI NO N | Off            | [I 31/03]         |
| 2 HI NO N | On             | [I 31/04]         |
| 3 HI NO N | Start          | [I 31/15]         |
| 4 HI NO N | Auto_Operation | [I 31/05]         |

.ADOUT TEMPLATE

/ -SI1-Well -\

Pressure |

1 2 3 4 5

\--feet H2O/

Template Base Cell 7

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name SI1 Well\_ Pressure

Units feet H2O

Value 1 Expression [B B 45]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

ADOUT TEMPLATE

/SI1-Casing\

Pressure |

1 2 3 4 5

\--feet H2O/

Template Base Cell 8

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name SI1 Casing\_ Pressure

Units feet H2O

Value 1 Expression [B B 44]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

arm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

```
/---LI-3---\  
| | | | |  
1 2 3 4 5  
\-----feet/
```

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name LI-3

Units feet

Value 1 Expression [B B 57]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

READOUT TEMPLATE  
/--LYL-2--\\  
Set Point | Template Base Cell 11  
1 2 3 4 5 Template Size/Character Size Decimal Places  
\\>-----feet/ NORMAL / QUAD 1  
Device Name LYL-2\_Set Point  
Units feet  
Value 1 Expression [B A 30]/10  
Value 2 Expression  
High Alarm Expression  
Low Alarm Expression  
Deadband Range 0 % of (High Alarm - Low Alarm)  
Alarm Acknowledgment Y  
Control Type NUMERIC  
Input Value Expression [?] \*10  
Target Word Address [B A 30]  
Password Protection A ONLY

## READOUT TEMPLATE

/--LYH-2--\

Set Point |

1 2 3 4 5

Template Base Cell 12

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                          1

\&gt;----feet/

Device Name LYH-2\_ Set Point

Units feet

Value 1 Expression [B A 31]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 31]

Password Protection A ONLY

READOUT TEMPLATE  
/---LYL-3--\ Set Point |  
| | Template Base Cell 13  
1 2 3 4 5 | Template Size/Character Size Decimal Places  
\>----feet/ NORMAL / QUAD 1  
Device Name LYL-3\_ Set Point  
Units feet  
Value 1 Expression [B A 32]/10  
Value 2 Expression  
High Alarm Expression  
Low Alarm Expression  
Deadband Range 0 % of (High Alarm - Low Alarm)  
Alarm Acknowledgment Y  
Control Type NUMERIC  
Input Value Expression [?] \*10  
Target Word Address [B A 32]  
Password Protection A ONLY

## READOUT TEMPLATE

/--LYH-3---\

Set Point |

1 2 3 4 5

Template Base Cell 14

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                            1

\&gt;-----feet/

Device Name LYH-3\_ Set Point

Units feet

Value 1 Expression [B A 33]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 33]

Password Protection A ONLY

|              |              |              |              |
|--------------|--------------|--------------|--------------|
| /--KC-300--\ | /--KC-300--\ | /--KC-300--\ | /--KC-300--\ |
| 1 2 3 4 5 6  | 1 2 3 4 5 6  | 1 2 3 4 5 6  | 1 2 3 4 5 6  |
| On Time      | Off Time     |              | Status       |
| \---seconds/ | \---seconds/ | \---seconds/ | \-----/      |

|              |              |              |              |
|--------------|--------------|--------------|--------------|
| /--KC-600--\ | /--KC-600--\ | /--KC-600--\ | /--KC-600--\ |
| 1 2 3 4 5 6  | 1 2 3 4 5 6  | 1 2 3 4 5 6  | 1 2 3 4 5 6  |
| On Time      | Off Time     |              | Status       |
| \---seconds/ | \---seconds/ | \---seconds/ | \-----/      |

## READOUT TEMPLATE

```
/--KC-300--\\
```

```
1 2 3 4 5 6
```

```
\---seconds/
```

Template Base Cell 1

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name KC-300

Units seconds

Value 1 Expression [B B 30]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/--KC-300--\

On Time

Template Base Cell 2

1 2 3 4 5 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

\&gt;--seconds/

Device Name KC-300\_ On Time

Units seconds

Value 1 Expression [B A 14]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

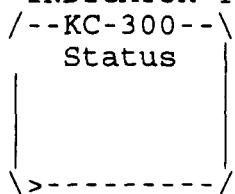
Input Value Expression [?]

Target Word Address [B A 14]

Password Protection NONE

READOUT TEMPLATE  
/--KC-300--\ Off Time |  
| 1 2 3 4 5 6 | Template Base Cell 3  
\>--seconds/ Template Size/Character Size Decimal Places  
NORMAL / QUAD 0  
Device Name KC-300\_ Off Time  
Units seconds  
Value 1 Expression [B A 15]  
Value 2 Expression  
High Alarm Expression  
Low Alarm Expression  
Deadband Range 0 % of (High Alarm - Low Alarm)  
Alarm Acknowledgment Y  
Control Type NUMERIC  
Input Value Expression [?]  
Target Word Address [B A 15]  
Password Protection NONE

## INDICATOR TEMPLATE



Template Base Cell 4

Template Size Character Size  
NORMAL NORMAL

Device Name KC-300\_ Status

| TEMPLATE DEFINITION TABLE |                |                        |     |
|---------------------------|----------------|------------------------|-----|
| FG BG B                   | Template Label | Conditional Expression |     |
| 1 HI NO N                 | On             | [O 31/5]               | N Y |
| 2 HI NO N                 |                |                        | N Y |
| 3 HI NO N                 |                |                        | N Y |
| 4 HI NO N                 |                |                        | N Y |
| HI NO N                   | Off            | 1                      | N Y |

## CONTROL BUTTON DEFINITION TABLE

Control Label PLC Bit Reference

|           |             |
|-----------|-------------|
| 1 HI NO N |             |
| 2 HI NO N |             |
| 3 HI NO N | Timer_Reset |
| 4 HI NO N | [I 31/6]    |

## READOUT TEMPLATE

```
/--KC-600--\
```

```
1 2 3 4 5 6
```

```
\---seconds/
```

Template Base Cell 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name KC-600

Units seconds

Value 1 Expression [B B 31]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

READOUT TEMPLATE

--KC-600--\

On Time

Template Base Cell 7

1 2 3 4 5 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

\>--seconds/

Device Name KC-600\_ On Time

Units seconds

Value 1 Expression [B A 16]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 16]

Password Protection NONE

## READOUT TEMPLATE

/--KC-600--\

Off Time |

1 2 3 4 5 6

\&gt;--seconds/

Template Base Cell 8

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        0

Device Name KC-600\_ Off Time

Units seconds

Value 1 Expression [B A 17]

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]

Target Word Address [B A 17]

Password Protection NONE

## INDICATOR TEMPLATE

--KC-600--\  
| Status |  
| |  
\-----/

Template Base Cell 9

Template Size Character Size  
NORMAL NORMAL

Device Name KC-600\_ Status

A A  
l c  
m k

## TEMPLATE DEFINITION TABLE

FG BG B Template Label Conditional Expression

|           |     |          |     |
|-----------|-----|----------|-----|
| 1 HI NO N | On  | [O 31/6] | N Y |
| 2 HI NO N |     |          | N Y |
| 3 HI NO N |     |          | N Y |
| 4 HI NO N |     |          | N Y |
| HI NO N   | Off | 1        | N Y |

## CONTROL BUTTON DEFINITION TABLE

FG BG B Control Label PLC Bit Reference

|           |             |
|-----------|-------------|
| 1 HI NO N |             |
| 2 HI NO N |             |
| 3 HI NO N | Timer_Reset |
| 4 HI NO N | [I 31/7]    |

```
/-AE-1001--\ /-AE-1002--\ /-AE-1003--\ /--Alarm---\  
|           |           |           | Reset  
1 2 3 4   5   1 2 3 4   5   1 2 3 4   5  
\---%Oxygen/ \-----%LFL/ \-----%LFL/ \-----/  
/-AAL-1001-\ /-AAH-1002-\ /-AAH-1003-\ /-TAH-GAC--\  
Set Point   Set Point   Set Point   Set Point  
|           |           |           |  
1 2 3 4   5   1 2 3 4   5   1 2 3 4   5  
\>---%Oxygen/ \>-----%LFL/ \>-----%LFL/ \>----deg F/  
/-TAH-300--\ /-TAH-500--\ /-TAH-600--\ /-TAHH-GAC-\  
Set Point   Set Point   Set Point   Set Point  
|           |           |           |  
1 2 3 4   5   1 2 3 4   5   1 2 3 4   5  
\>----deg F/ \>----deg F/ \>----deg F/ \>----deg F/
```

## READOUT TEMPLATE

/-AE-1001--\

1 2 3 4 5

Template Base Cell 1

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\---%Oxygen/

Device Name AE-1001

Units %Oxygen

Value 1 Expression [B B 36]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-AE-1002--\

1 2 3 4 5

Template Base Cell 2

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name AE-1002

Units %LFL

Value 1 Expression [B B 37]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## READOUT TEMPLATE

/-AE-1003--\

1 2 3 4 5

Template Base Cell 3

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name AE-1003

Units %LFL

Value 1 Expression [B B 17]/10

Value 2 Expression

High Alarm Expression

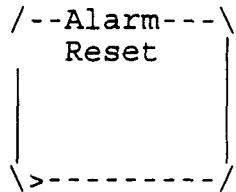
Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NONE

## INDICATOR TEMPLATE



Template Base Cell 4

Template Size Character Size  
NORMAL NORMAL

Device Name Alarm\_ Reset

| FG BG B   | Template Label | Conditional Expression | A A<br>l c<br>m k |
|-----------|----------------|------------------------|-------------------|
| 1 HI NO N |                |                        | N Y               |
| 2 HI NO N |                |                        | N Y               |
| 3 HI NO N |                |                        | N Y               |
| 4 HI NO N |                |                        | N Y               |
| HI NO N   |                |                        | N Y               |

## CONTROL BUTTON DEFINITION TABLE

Control Label PLC Bit Reference

|           |                 |
|-----------|-----------------|
| 1 HI NO N |                 |
| 2 HI NO N | Reset [I 31/13] |
| 3 HI NO N |                 |
| 4 HI NO N |                 |

...ADOUT TEMPLATE

/-AAL-1001-\

Set Point |

| 1 2 3 4 5

\>--%Oxygen/

Template Base Cell 6

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

Device Name AAL-1001\_Set Point

Units %Oxygen

Value 1 Expression [B A 0]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 0]

Password Protection A ONLY

## READOUT TEMPLATE

/-AAH-1002-\

Set Point  
1 2 3 4 5

Template Base Cell 7

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\&gt;-----%LFL/

Device Name AAH-1002\_Set Point

Units %LFL

Value 1 Expression [B A 1]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 1]

Password Protection A ONLY

## ...ADOUT TEMPLATE

/-AAH-1003-\

Set Point |

1 2 3 4 5

Template Base Cell 8

Template Size/Character Size      Decimal Places  
                  NORMAL / QUAD                        1

\&gt;-----%LFL/

Device Name AAH-1003\_Set Point

Units %LFL

Value 1 Expression [B A 10]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 10]

Password Protection A ONLY

## READOUT TEMPLATE

/-TAH-GAC--\

Set Point |

1 2 3 4 5

Template Base Cell 9

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                          1

\&gt;----deg F/

Device Name TAH-GAC\_ Set Point

Units deg F

Value 1 Expression [B A 22]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 22]

Password Protection A ONLY

## READOUT TEMPLATE

/-TAH-300--\

Set Point |  
| 1 2 3 4 5

Template Base Cell 11

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\&gt;----deg F/

Device Name TAH-300\_ Set Point

Units deg F

Value 1 Expression [B A 5]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 5]

Password Protection A ONLY

.READOUT TEMPLATE

/-TAH-500--\

Set Point |

| 1 2 3 4 5

\>----deg F/

Template Base Cell 12

Template Size/Character Size Decimal Places

NORMAL / QUAD 1

Device Name TAH-500\_ Set Point

Units deg F

Value 1 Expression [B A 6]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]\*10

Target Word Address [B A 6]

Password Protection A ONLY

## READOUT TEMPLATE

/-TAH-600--\

Set Point |

1 2 3 4 5

Template Base Cell 13

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\&gt;----deg F/

Device Name TAH-600\_ Set Point

Units deg F

Value 1 Expression [B A 7]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?] \*10

Target Word Address [B A 7]

Password Protection A ONLY

.READOUT TEMPLATE

/-TAHH-GAC-\

Set Point |

| 1 2 3 4 5

Template Base Cell 14

Template Size/Character Size      Decimal Places  
NORMAL / QUAD                        1

\>----deg F/

Device Name TAHH-GAC\_ Set Point

Units deg F

Value 1 Expression [B A 23]/10

Value 2 Expression

High Alarm Expression

Low Alarm Expression

Deadband Range 0 % of (High Alarm - Low Alarm)

Alarm Acknowledgment Y

Control Type NUMERIC

Input Value Expression [?]\*10

Target Word Address [B A 23]

Password Protection A ONLY

## PLC NAME AND PORT TABLE

## VCP UNIT PORT PARAMETER TABLE

| Port# | Network |     |           |      |        | Stop | Baud  | Format for Generic Protocol |     |          |
|-------|---------|-----|-----------|------|--------|------|-------|-----------------------------|-----|----------|
|       | Use     | ID# | Data Bits | Bits | Parity |      |       | Type                        | ID# | BCC/Bit# |
| 1     | PRINTER |     | 8         | 1    | NONE   | 9600 |       |                             |     |          |
| 2     | NONE    | 0   | 8         | 1    | NONE   | 9600 | RS232 |                             |     |          |
| I/O   | A-B REM |     |           |      |        | 57 6 |       |                             |     |          |

## PLC NAME TABLE

| Item | Name | ID# | Port | Model   | Default PLC Name   |          |
|------|------|-----|------|---------|--------------------|----------|
| 1    | PLC1 | 0   | I/O  | PLC5/15 | PLC1               |          |
| 2    |      | 0   |      | 2       |                    |          |
| 3    |      | 0   |      | 2       | Screen Scan Delay  | 0 00 sec |
| 4    |      | 0   |      | 2       | Alarm Scan Delay   | 0 00 sec |
| 5    |      | 0   |      | 2       | Message Scan Delay | 0 00 sec |
| 6    |      | 0   |      | 2       |                    |          |
| 7    |      | 0   |      | 2       |                    |          |
| 8    |      | 0   |      | 2       |                    |          |
| 9    |      | 0   |      | 2       |                    |          |
| 10   |      | 0   |      | 2       |                    |          |

## ALLEN-BRADLEY REMOTE I/O CONFIGURATION

## PLC Model PLC5/15

## ACTIVE RACK TABLE

## QTR

# 1234

1

2

3 4\*\*\*

## ACTIVE BLOCK TRANSFER TABLE

| Transfer | Direct | Rack | Group | Slot | Size |
|----------|--------|------|-------|------|------|
| A        | COMMON | 3    | 7     | 1    | 32   |
| B        | WRITE  | 3    | 7     | 0    | 64   |
| C        | NONE   |      |       |      |      |
| D        | NONE   |      |       |      |      |
| E        | NONE   |      |       |      |      |
| F        | NONE   |      |       |      |      |
| G        | NONE   |      |       |      |      |
| H        | NONE   |      |       |      |      |
| I        | NONE   |      |       |      |      |
| J        | NONE   |      |       |      |      |
| K        | NONE   |      |       |      |      |
| L        | NONE   |      |       |      |      |
| M        | NONE   |      |       |      |      |
| N        | NONE   |      |       |      |      |
| O        | NONE   |      |       |      |      |
| P        | NONE   |      |       |      |      |

## SYSTEM PARAMETERS TABLE

|                                 |                    |                       |                      |      |
|---------------------------------|--------------------|-----------------------|----------------------|------|
|                                 | Audio Output       | Startup               | Page Number          | 0    |
|                                 | Operator Input LOW |                       |                      |      |
|                                 | Alarms LOW         |                       |                      |      |
|                                 |                    | Inactivity Periods    |                      |      |
|                                 |                    | Screen Blanking       | 40                   | mins |
|                                 |                    | Automatic Cancel      | OFF                  | mins |
|                                 |                    | Page Password Timeout | OFF                  | mins |
| Fault Relay Deenergize on Alarm | N                  |                       |                      |      |
| Host Display Window             | N                  |                       | Password A           | 1    |
| Immediate Page Change           | N                  |                       | Password B           | 2    |
| Page Status Line Display        | STANDARD           |                       | Password A Overwrite | N    |
| Control Bit Reset Delay         | 0                  | msec                  | Password B Overwrite | N    |
| Bit Zero After Com Fault        | N                  |                       |                      |      |
| Retry Delay                     | Y                  |                       | Password Protection  |      |
|                                 |                    |                       | Offline Mode         | NONE |
|                                 |                    |                       | Set Date/Time        | NONE |
|                                 |                    |                       | Password A Enable    | Y    |
|                                 |                    |                       | Password B Enable    | Y    |
| Remote Alarm                    | (to PLC)           |                       |                      |      |
| Acknowledge Bit                 | (from PLC)         |                       |                      |      |
| Remote Silence                  | (to PLC)           |                       |                      |      |
| Alarm Horn Bit                  | (from PLC)         |                       |                      |      |
| Remote Enable                   | (to PLC)           |                       |                      |      |
| Fault Relay Bit                 | (from PLC)         |                       |                      |      |
| Remote Sending of Passwords     |                    |                       |                      |      |
|                                 | Password A         |                       |                      |      |
|                                 | Password B         |                       |                      |      |
| Hardware Selection              |                    |                       |                      |      |
| Page Change                     | (to PLC)           |                       |                      |      |
| Register                        | (from PLC)         |                       |                      |      |
| Reset Clock to 00 00 00 Bit     |                    |                       |                      |      |

-----  
Allen-Bradley Company  
6200 Series Software  
PLC-5 Programming Terminal Software  
Release 4.3  
Program Listing Report

Processor File: EGGVAP  
4 February 1994 - 13:51

REPORT OPTIONS

|                         |           |
|-------------------------|-----------|
| Page Width:             | 80        |
| Page Length:            | 66        |
| Graphics Capabilities:  | NO        |
| Right Power Rail:       | YES       |
| Address Display:        | SYMBOL    |
| Address Comments:       | YES       |
| Rung Comments:          | YES       |
| Output Cross Reference: | NO        |
| Ladder Cross Reference: | ALL       |
| Starting Rung:          | 2:0       |
| Ending Rung:            | 999:32767 |

Rung 2:0

Block transfer read/write for 1771-IFE (non-isolated) analog input #1

|       |                                   |                                                                                                                                                   |
|-------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| N12:0 | +BTR-----+<br>+---]/[-----+<br>15 | +BLOCK TRNSFR READ +--(EN)--<br>Rack 01<br>Group 4--(DN)<br>Module 0<br>Control Block N12:0--(ER)<br>Data file N10:0<br>Length 20<br>Continuous N |
|-------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|

N10:0

-BTR- 2:0

N12:0

-BTR- 2:0

N12:0/15

-]/[- 2:0

Rung 2:1

| N10:0 N12:5

+---] [---]/[---+  
0 15

|                                     |                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| +BTW-----+<br>+---]/[-----+<br>0 15 | +BLOCK TRNSFR WRITE +--(EN)--<br>Rack 01<br>Group 4--(DN)<br>Module 0<br>Control Block N12:5--(ER)<br>Data file N9:0<br>Length 37<br>Continuous N |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|

N9:0

-BTW- 2:1

N10:0/0

-] [- 2:1

N12:5

-BTW- 2:1

N12:5/15

-]/[- 2:1

Rung 2:2

Block transfer read/write for 1771-IFE (non-isolated) analog module #2

N12:55

+---] [---/-----+  
15

|                                   |                                                                                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| +BTR-----+<br>+---]/[-----+<br>15 | +BLOCK TRNSFR READ +--(EN)--<br>Rack 01<br>Group 0--(DN)<br>Module 0<br>Control Block N12:55--(ER)<br>Data file N10:32<br>Length 20<br>Continuous N |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|

N10:32

-BTR- 2:2

N12:55

-BTR- 2:2

N12:55/15

-]/[- 2:2

Rung 2:3

```
| N10:32 N12:50
+---] [----]/[-----
    0      15
```

|                               |
|-------------------------------|
| +BTW-----+                    |
| +BLOCK TRNSFR WRITE +-(EN) -- |
| Rack          01              |
| Group         0--(DN)         |
| Module         0              |
| Control Block  N12:50+- (ER)  |
| Data file     N9:56           |
| Length        37              |
| Continuous     N              |

N9:56

```
-BTW- 2:3
N10:32/0
  -] [- 2:3
N12:50
  -BTW- 2:3
N12:50/15
  -]/[- 2:3
```

Rung 2:4

Block transfer read/write for 1771-IL (isolated) analog input module #1

```
| N12:10
+---] /[-----
```

15

|                              |
|------------------------------|
| +BTR-----+                   |
| +BLOCK TRNSFR READ +-(EN) -- |
| Rack          01             |
| Group         6--(DN)        |
| Module         0             |
| Control Block  N12:10+- (ER) |
| Data file     N10:20         |
| Length        12             |
| Continuous     N             |

N10:20

```
-BTR- 2:4
N12:10
  -BTR- 2:4
N12:10/15
  -]/[- 2:4
```

Rung 2:5

```
| N10:20 N12:15
+---] [----]/[-----
    0      15
```

|                               |
|-------------------------------|
| +BTW-----+                    |
| +BLOCK TRNSFR WRITE +-(EN) -- |
| Rack          01              |
| Group         6--(DN)         |
| Module         0              |
| Control Block  N12:15+- (ER)  |
| Data file     N9:37           |
| Length        19              |
| Continuous     N              |

N9:37

```
-BTW- 2:5
N10:20/0
  -] [- 2:5
N12:15
  -BTW- 2:5
`2:15/15
```

N12:15/15  
-]/[- 2:5

Rung 2:6  
Block transfer read/write for 1771-IL analog input module #2

|            |                              |
|------------|------------------------------|
| N12:20     | +BTR-----                    |
| +---]/[--- | +BLOCK TRNSFR READ +-(EN)--- |
| 15         | Rack 02                      |
|            | Group 0--(DN)                |
|            | Module 0                     |
|            | Control Block N12:20--(ER)   |
|            | Data file N10:52             |
|            | Length 12                    |
|            | Continuous N                 |

N10:52  
-BTR- 2:6

N12:20  
-BTR- 2:6

N12:20/15  
-]/[- 2:6

Rung 2:7  
| N10:52 N12:25  
+---] [---]/[--- +BTW-----+  
| 0 15 +BLOCK TRNSFR WRITE +-(EN)---

|                            |
|----------------------------|
| Rack 02                    |
| Group 0--(DN)              |
| Module 0                   |
| Control Block N12:25--(ER) |
| Data file N9:93            |
| Length 19                  |
| Continuous N               |

N9:93  
-BTW- 2:7

N10:52/0  
-] [- 2:7

N12:25  
-BTW- 2:7

N12:25/15  
-]/[- 2:7

Rung 2:8  
Transfer data from analog input modules into working integer file (N7)

|       |                                                       |
|-------|-------------------------------------------------------|
| N12:0 | +FAL-----+<br>+---]/[--- +FILE ARITH/LOGICAL--(EN)--- |
| 13    | Control R6:1                                          |
|       | Length 16--(DN)                                       |
|       | Position 15                                           |
|       | Mode ALL--(ER)                                        |
|       | Dest #N7:0                                            |
|       | 1000                                                  |
|       | Expression #N10:4                                     |

N7:0  
-BTW- 2:12  
-FAL- 2:8

N7:0  
  -GRT- 2:31 2:32  
N10:4  
  -FAL- 2:8  
N12:0/13  
  -]/[- 2:8  
R6:1  
  -FAL- 2:8

Rung 2:9

| N12:10

+--]/[-----  
  13

+FAL-----+  
+FILE ARITH/LOGICAL--(EN)--  
| Control      R6:2 |  
| Length        8+- (DN) |  
| Position      7 |  
| Mode          ALL--(ER) |  
| Dest          #N7:16 |  
|                444 |  
| Expression    #N10:24 |  
+-----+

N7:16  
  -FAL- 2:9  
N10:24  
  -FAL- 2:9  
N12:10/13  
  -]/[- 2:9  
  ::2  
    -FAL- 2:9

Rung 2:10

| N12:55

+--]/[-----  
  13

+FAL-----+  
+FILE ARITH/LOGICAL--(EN)--  
| Control      R6.3 |  
| Length        8+- (DN) |  
| Position      7 |  
| Mode          ALL--(ER) |  
| Dest          #N7:30 |  
|                197 |  
| Expression    #N10:36 |  
+-----+

N7:30  
  -FAL- 2:10  
  -GRT- 2:18  
N10:36  
  -FAL- 2:10  
N12:55/13  
  -]/[- 2:10  
R6:3  
  -FAL- 2:10

## Program Listing Report

PLC-5/15

4 February 1994 Page 5  
File EGGVAP Rung 2.11

Rung 2:11

| N12:20

+---]/[-----  
| 13

|                             |
|-----------------------------|
| +FAL-----+                  |
| +FILE ARITH/LOGICAL+(EN) +- |
| Control R6:4                |
| Length 8+- (DN)             |
| Position 7                  |
| Mode ALL+- (ER)             |
| Dest #N7:38                 |
| 0                           |
| Expression                  |
| #N10:56                     |

N7:38

-ADD- 2:132  
-FAL- 2:11

N10:56

-FAL- 2:11

N12:20/13

-]/[- 2:11

R6:4

-FAL- 2:11

Rung 2:12

Transfer analog values to &amp; from MMI

N12:40

+---]/[-----  
| 15

|                                |
|--------------------------------|
| +BTW-----+                     |
| +BLOCK TRNSFR WRITE +- (EN) +- |
| Rack 03                        |
| Group 7+- (DN)                 |
| Module 0                       |
| Control Block N12.40+- (ER)    |
| Data file N7:0                 |
| Length 64                      |
| Continuous N                   |

N7:0

-BTW- 2:12  
-FAL- 2:8  
-GRT- 2:31 2:32

N12:40

-BTW- 2:12

N12:40/15

-]/[- 2:12

Rung 2:13

N12:45 S:7

+---]/[----]/[-----  
| 15        3

|                               |
|-------------------------------|
| +BTR-----+                    |
| +BLOCK TRNSFR READ +- (EN) +- |
| Rack 03                       |
| Group 7+- (DN)                |
| Module 1                      |
| Control Block N12:45+- (ER)   |
| Data file N13:0               |
| Length 32                     |
| Continuous N                  |

N12:45

-BTR- 2:13  
-BTW- 2:14

## I ram Listing Report

4 February 1994 Page 6  
 PLC-5/15 File EGGVAP Rung 2:13

N12:45/15  
 -]/[- 2:13

N13:0  
 -BTR- 2:13  
 -BTW- 2:14  
 -FAL- 2:15

S.7/3  
 -] [- 2:14  
 -]/[- 2:13

Rung 2:14

| N12:60 S:7  
 +---]/[---] [-----]  
 | 15 3

|               |                               |
|---------------|-------------------------------|
| +BTW-----+    | +BLOCK TRNSFR WRITE +-(EN)--- |
| Rack          | 03                            |
| Group         | 7+-(DN)                       |
| Module        | 1                             |
| Control Block | N12:45+-(ER)                  |
| Data file     | N13:0                         |
| Length        | 32                            |
| Continuous    | N                             |

N12:45  
 -BTR- 2:13  
 -BTW- 2:14

N12:60/15  
 -]/[- 2:14

N13:0  
 -BTR- 2:13  
 -BTW- 2:14  
 -FAL- 2:15

S:7/3  
 -] [- 2:14  
 -]/[- 2:13

Rung 2:15

| N12:45  
 +---]/[---]  
 | 13

|            |                             |
|------------|-----------------------------|
| +FAL-----+ | +FILE ARITH/LOGICAL-(EN)--- |
| Control    | R6:0                        |
| Length     | 32+-(DN)                    |
| Position   | 31                          |
| Mode       | ALL+-(ER)                   |
| Dest       | #N7:64<br>190               |
| Expression | #N13:0                      |

N7:64  
 -FAL- 2:15  
 -GRT- 2:18

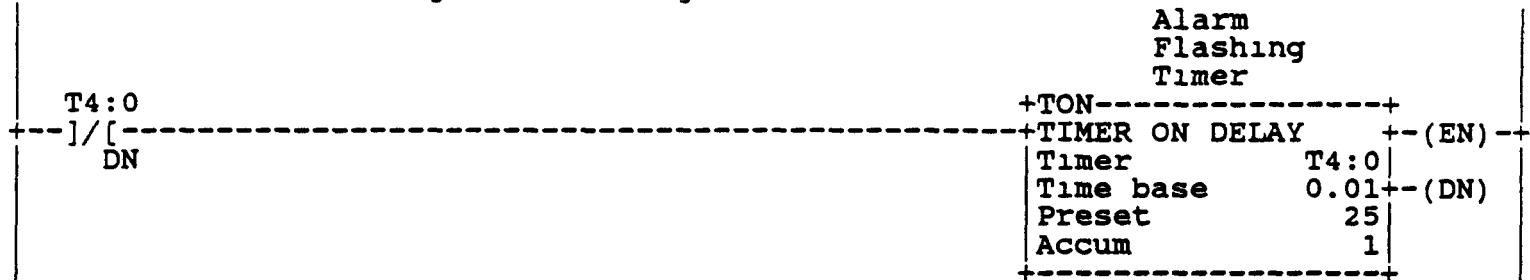
N12:45/13  
 -]/[- 2:15

N13:0  
 -BTR- 2:13  
 -BTW- 2:14  
 -FAL- 2:15

R6:0  
 -FAL- 2:15

Rung 2:16

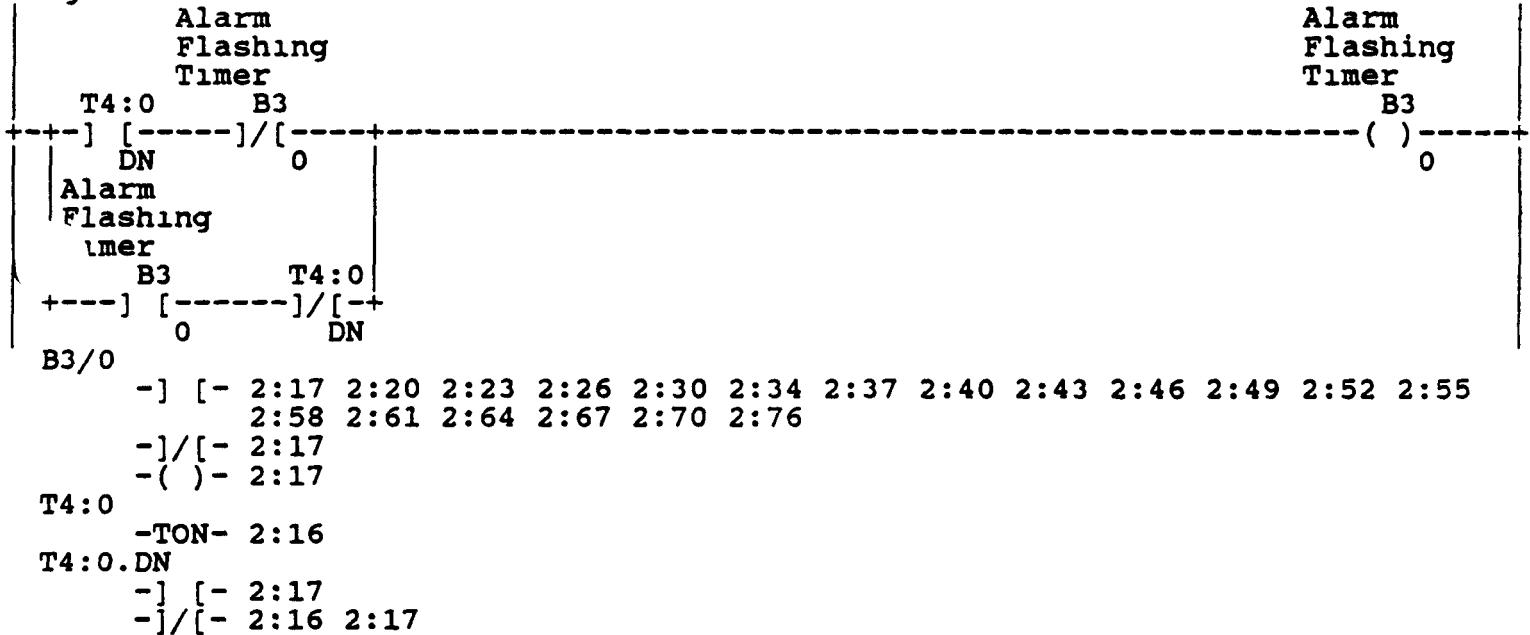
Provide for the flasing of alarm lights



T4:0 -TON- 2:16

T4:0.DN  
-] [- 2:17  
-]/[- 2:16 2:17

Rung 2:17



Rung 2:18

Alarm logic for AAL-1001

AAL-1001

Set Point

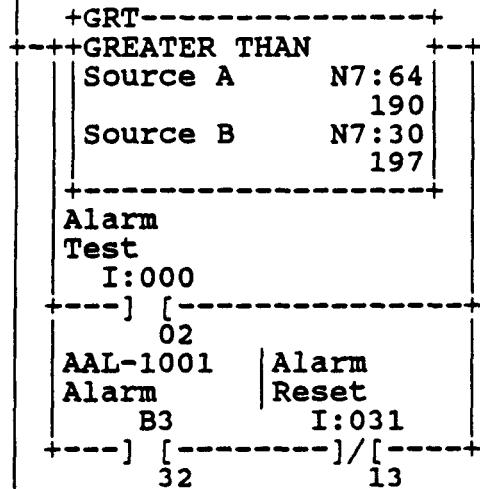
AAL-1001

Alarm

B3

( )

32



B3/32

-] [- 2:18 2:19 2:20 2:77 2:78  
-( )- 2:18

I:000/02

-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:74  
.031/13  
-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

N7:30

-FAL- 2:10  
-GRT- 2:18

N7:64

-FAL- 2:15  
-GRT- 2:18

Rung 2:19

AAL-1001

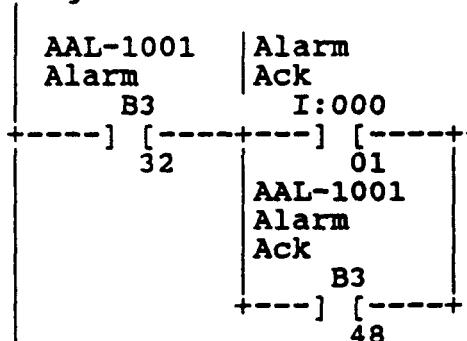
Alarm

Ack

B3

( )

48



B3/32

-] [- 2:18 2:19 2:20 2:77 2:78  
-( )- 2:18

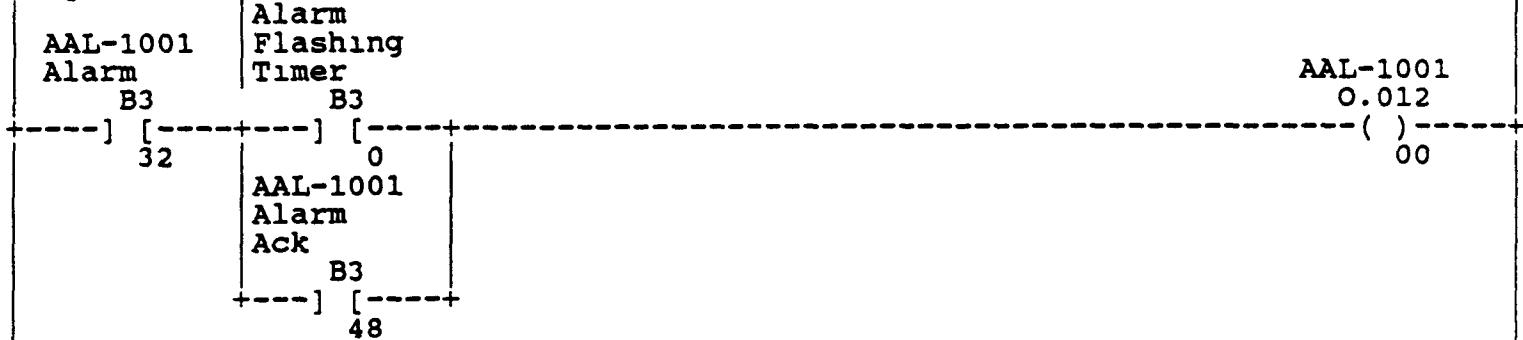
B3/48

-] [- 2:19 2:20  
-]/[- 2:78

B3/48

-(-) - 2:19  
 I:000/01  
 -] [- 2:19 2:22 2:25 2:29 2:33 2 36 2:39 2:42 2:45 2:48 2:51 2:54 2 57  
 2:60 2.63 2:66 2:69 2:75

Rung 2:20



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17  
 -(-) - 2:17

B3/32

-] [- 2:18 2:19 2:20 2:77 2:78  
 -(-) - 2:18

/48

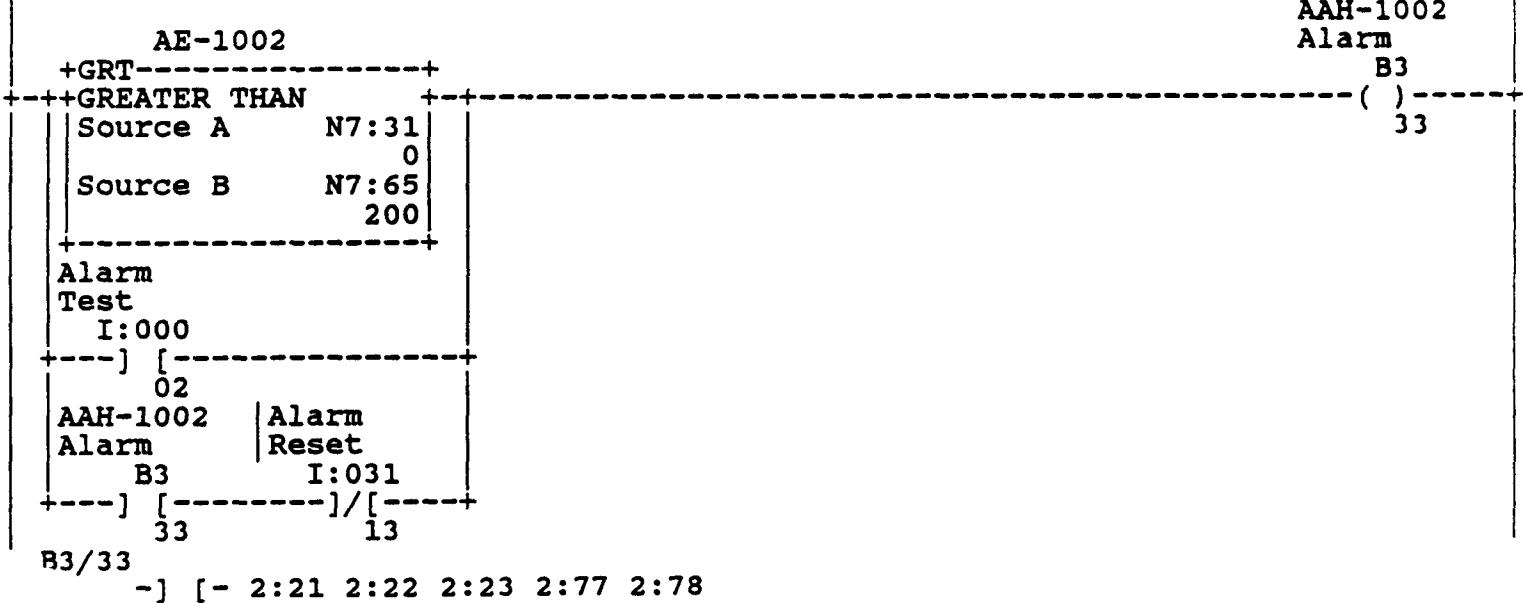
-] [- 2:19 2:20  
 -]/[- 2:78  
 -(-) - 2:19

0:012/00

-(-) - 2:20

Rung 2:21

Alarm logic for AAH-1002



B3/33

-( )- 2:21

I:000/02

-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:74

I:031/13

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

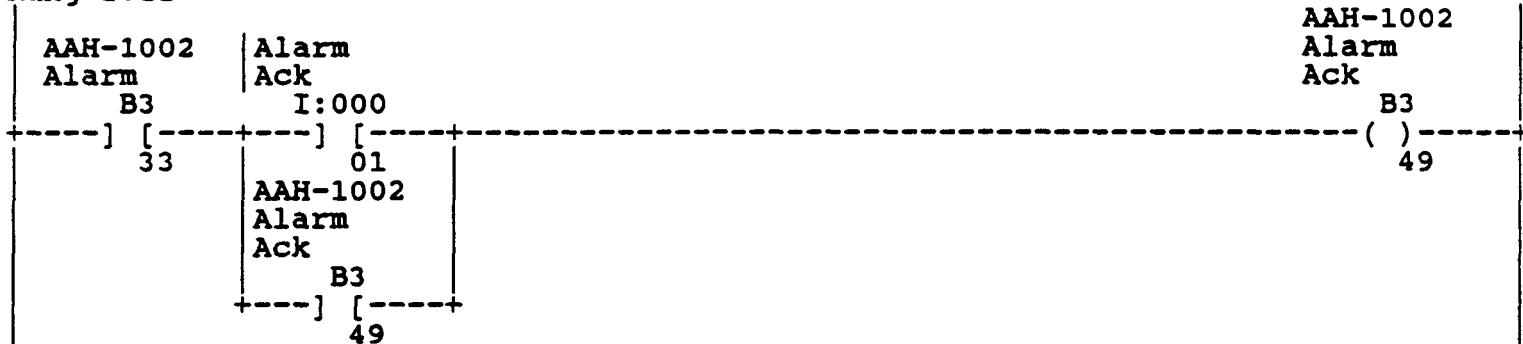
N7:31

-GRT- 2:21

N7:65

-GRT- 2:21

Rung 2:22



~3/33

-] [- 2:21 2:22 2:23 2:77 2:78  
-( )- 2:21

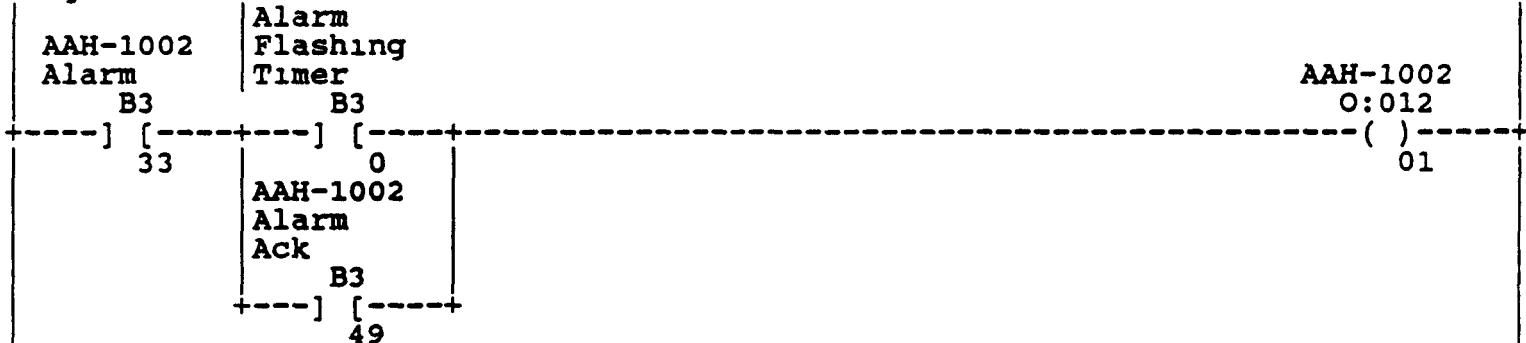
B3/49

-] [- 2:22 2:23  
-]/[- 2:78  
-( )- 2:22

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:23



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17

B3/33

-] [- 2:21 2:22 2:23 2:77 2:78

## Program Listing Report

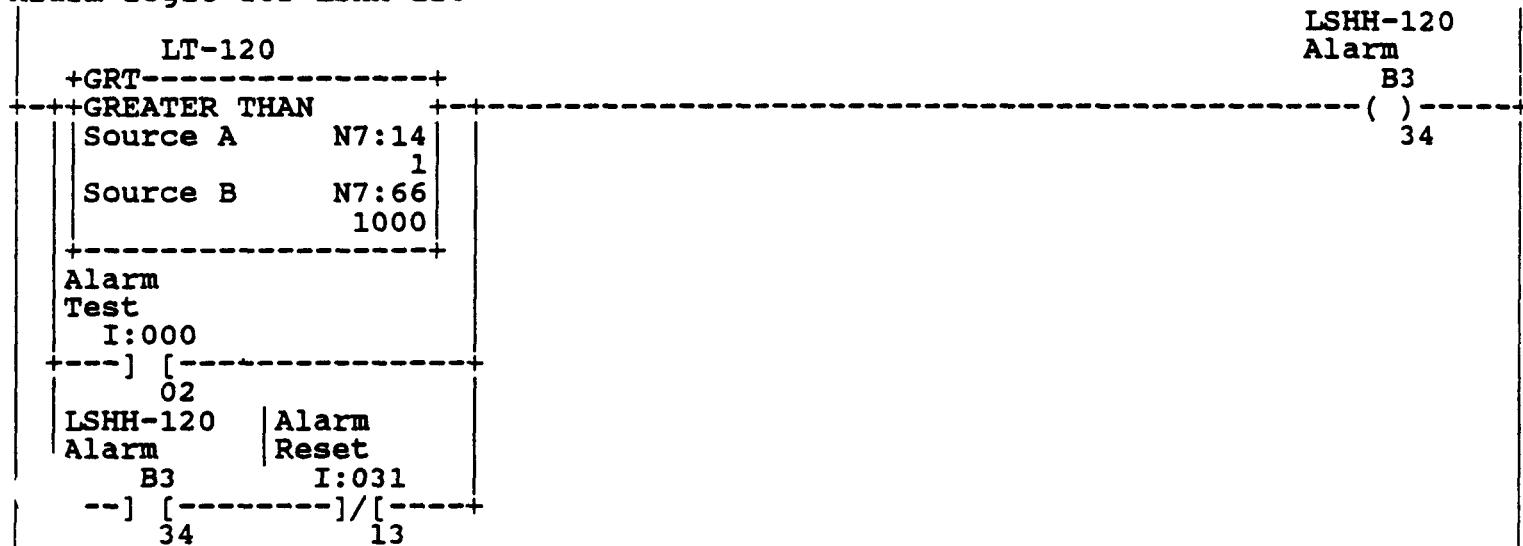
PLC-5/15

File EGGVAP

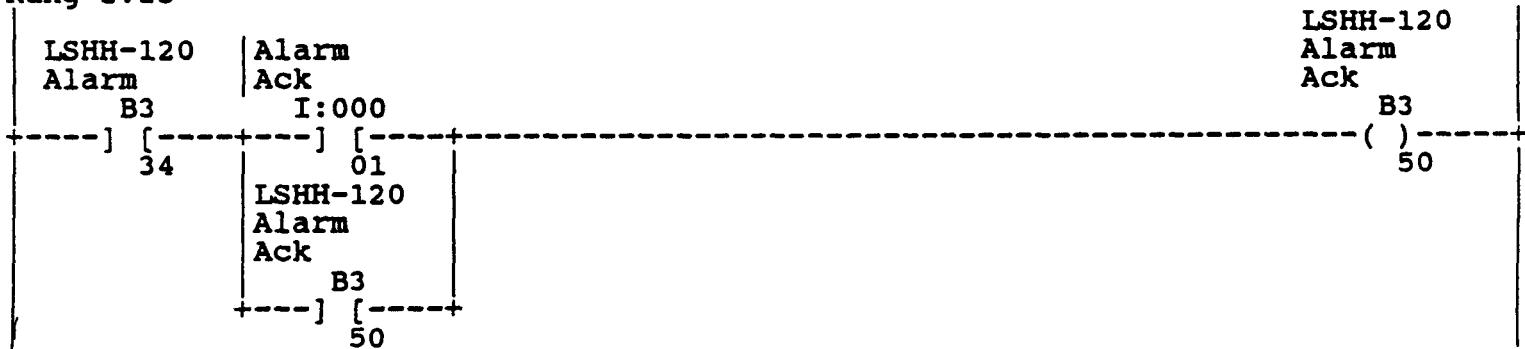
4 February 1994 Page 11  
Rung 2·23B3/33  
-( )- 2:21B3/49  
-] [- 2:22 2:23  
-]/[- 2:78  
-( )- 2:22  
0:012/01  
-( )- 2:23

Rung 2:24

Alarm logic for LSHH-120

B3/34  
-] [- 2:24 2:25 2:26 2:78  
-]/[- 2:86 2:87 2:91 2:92  
-( )- 2:24I:000/02  
-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:74  
I:031/13  
-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99N7:14  
-GRT- 2:24 2:124 2:124N7:66  
-GRT- 2:24

Rung 2:25



B3/34

```
-] [- 2:24 2:25 2:26 2:78
-]/[- 2:86 2:87 2:91 2:92
-( )- 2:24
```

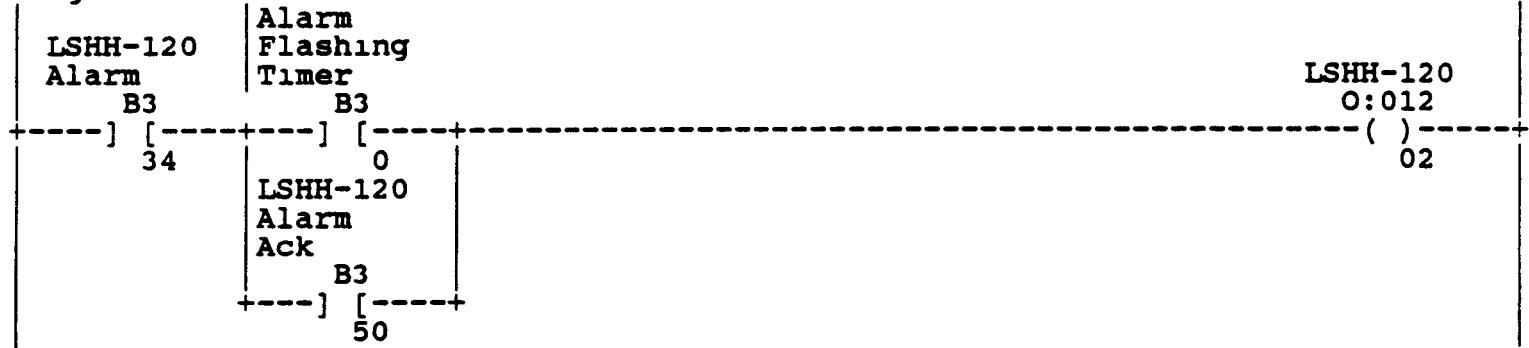
B3/50

```
-] [- 2:25 2:26
-]/[- 2:78
-( )- 2:25
```

I:000/01

```
-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57
2:60 2:63 2:66 2:69 2:75
```

Rung 2:26



B3/0

```
-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55
2:58 2:61 2:64 2:67 2:70 2:76
-]/[- 2:17
-( )- 2:17
```

B3/34

```
-] [- 2:24 2:25 2:26 2:78
-]/[- 2:86 2:87 2:91 2:92
-( )- 2:24
```

B3/50

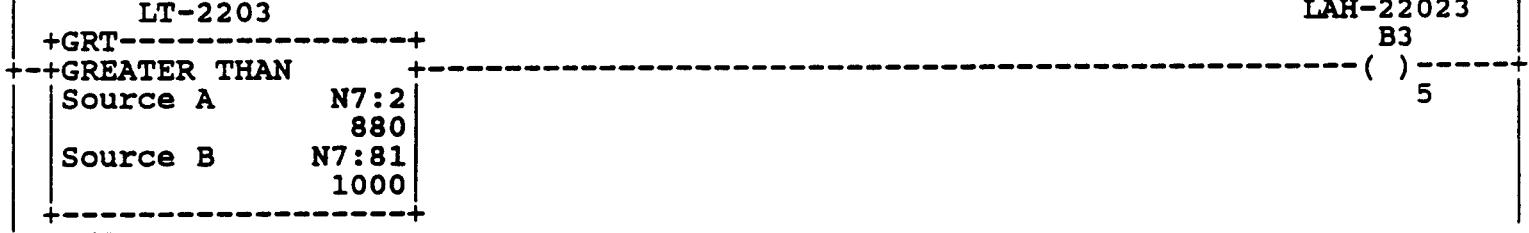
```
-] [- 2:25 2:26
-]/[- 2:78
-( )- 2:25
```

0:012/02

```
-( )- 2:26
```

Rung 2:27

Set output for LAHH-2202



B3/5

```
-] [- 2:28
-]/[- 2:125
-( )- 2:27
```

N7:2

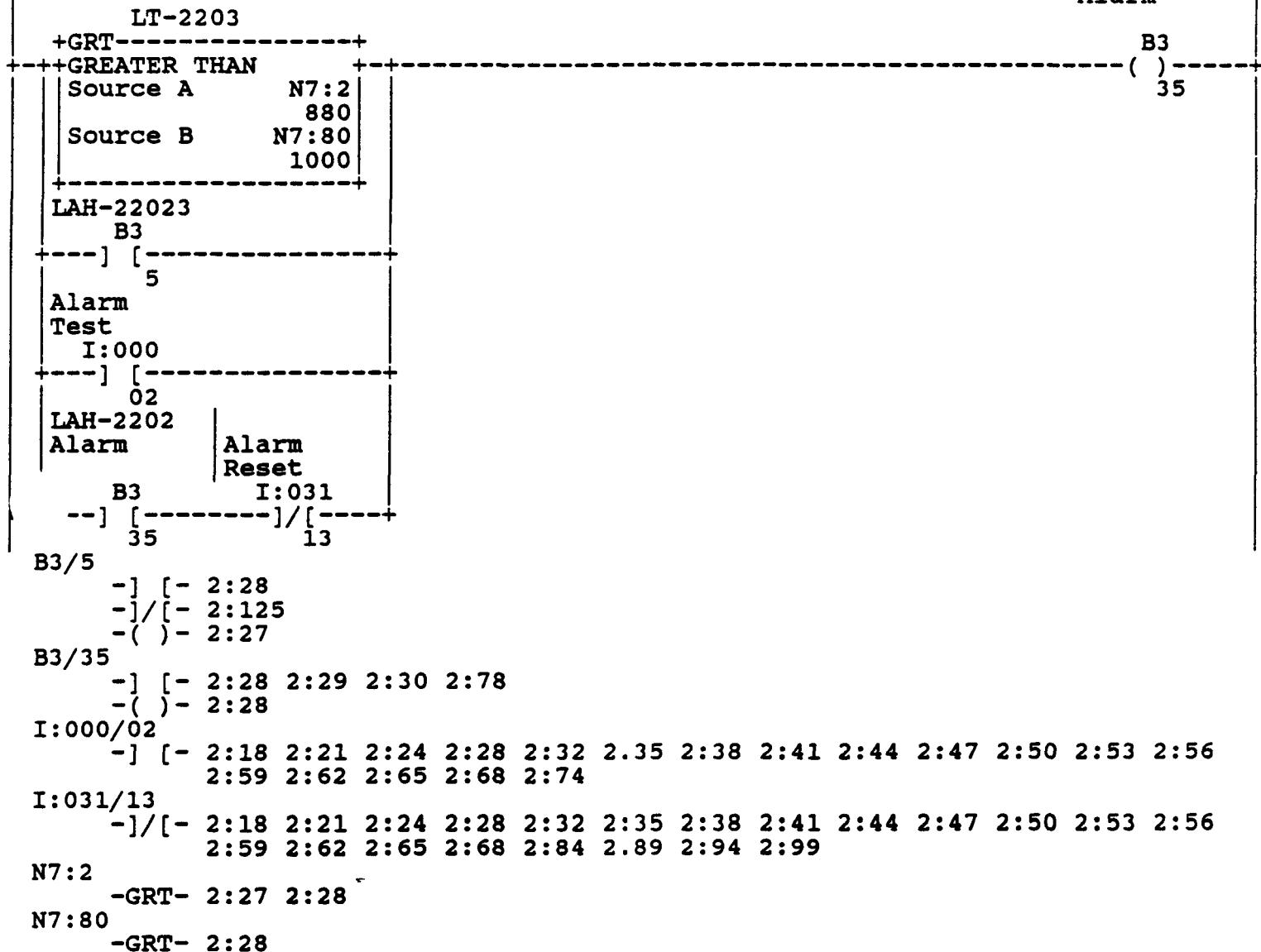
```
-GRT- 2:27 2:28
```

N7:81

-GRT- 2:27

Rung 2:28

Alarm logic for LAH-2202

LAH-2202  
Alarm

Rung 2·29

|          |                                                                  |          |
|----------|------------------------------------------------------------------|----------|
| LAH-2202 |                                                                  | LAH-2202 |
| Alarm    | Alarm                                                            | Alarm    |
| B3       | Ack                                                              | Ack      |
| -----]   | I:000                                                            | -----]   |
| 35       | 01                                                               | ( )----- |
|          | LAH-2202                                                         | B3       |
|          | Alarm                                                            |          |
|          | Ack                                                              |          |
|          | B3                                                               |          |
|          | -----]                                                           | 51       |
| B3/35    |                                                                  |          |
| -] [-    | 2:28 2:29 2:30 2:78                                              |          |
| -(- )-   | 2:28                                                             |          |
| B3/51    |                                                                  |          |
| -] [-    | 2:29 2:30                                                        |          |
| -]/[-    | 2:78                                                             |          |
| -(- )-   | 2:29                                                             |          |
| I.000/01 |                                                                  |          |
| -] [-    | 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57 |          |
|          | 2:60 2:63 2:66 2:69 2:75                                         |          |

Rung 2·30

|          |                                                                  |          |
|----------|------------------------------------------------------------------|----------|
| LAH-2202 |                                                                  | LAH-2202 |
| ^alarm   | Alarm                                                            | O:012    |
|          | Flashing                                                         | ( )----- |
|          | Timer                                                            | 04       |
| B3       | B3                                                               |          |
| -----]   | -----]                                                           |          |
| 35       | 0                                                                |          |
|          | LAH-2202                                                         |          |
|          | Alarm                                                            |          |
|          | Ack                                                              |          |
|          | B3                                                               |          |
|          | -----]                                                           |          |
|          | 51                                                               |          |
| B3/0     |                                                                  |          |
| -] [-    | 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2 55 |          |
|          | 2:58 2:61 2:64 2:67 2:70 2:76                                    |          |
| -]/[-    | 2:17                                                             |          |
| -(- )-   | 2:17                                                             |          |
| B3/35    |                                                                  |          |
| -] [-    | 2:28 2:29 -2:30 2:78                                             |          |
| -(- )-   | 2:28                                                             |          |
| B3/51    |                                                                  |          |
| -] [-    | 2:29 2:30                                                        |          |
| -]/[-    | 2:78                                                             |          |
| -(- )-   | 2:29                                                             |          |
| O:012/04 |                                                                  |          |
| -(- )-   | 2:30                                                             |          |

Rung 2:31

Set output for LAHH-2201

LT-2201

LAH-2201

B3

( )-----

4

|                           |  |
|---------------------------|--|
| +GRT-----+                |  |
| -----+GREATER THAN +----- |  |
| Source A N7:0             |  |
| 1000                      |  |
| Source B N7:68            |  |
| 1000                      |  |
| -----+                    |  |

B3/4

-] [- 2:32  
-]/[- 2:125  
-( )- 2:31

N7:0

-BTW- 2:12  
-FAL- 2:8  
-GRT- 2:31 2:32

N7:68

-GRT- 2:31

Rung 2:32

Alarm logic for LAH-2201

LT-2201

LAH-2201

Alarm

( )-----

36

|                           |  |
|---------------------------|--|
| +GRT-----+                |  |
| -----+GREATER THAN +----- |  |
| Source A N7:0             |  |
| 1000                      |  |
| Source B N7:67            |  |
| 1000                      |  |
| -----+                    |  |

LAH-2201

B3

B3  
-----] [-----  
        4

Alarm

Test

I:000

|                       |  |
|-----------------------|--|
| -----] [-----         |  |
| 02                    |  |
| LAH-2201   Alarm      |  |
| Alarm        Reset    |  |
| B3      I:031         |  |
| -----] [-----]/[----- |  |
| 36      13            |  |

B3/4

-] [- 2:32  
-]/[- 2:125  
-( )- 2:31

B3/36

-] [- 2:32 2:33 2:34 2:79  
-( )- 2:32

I:000/02

-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
    2:59 2:62 2:65 2:68 2:74

I:031/13

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2.56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

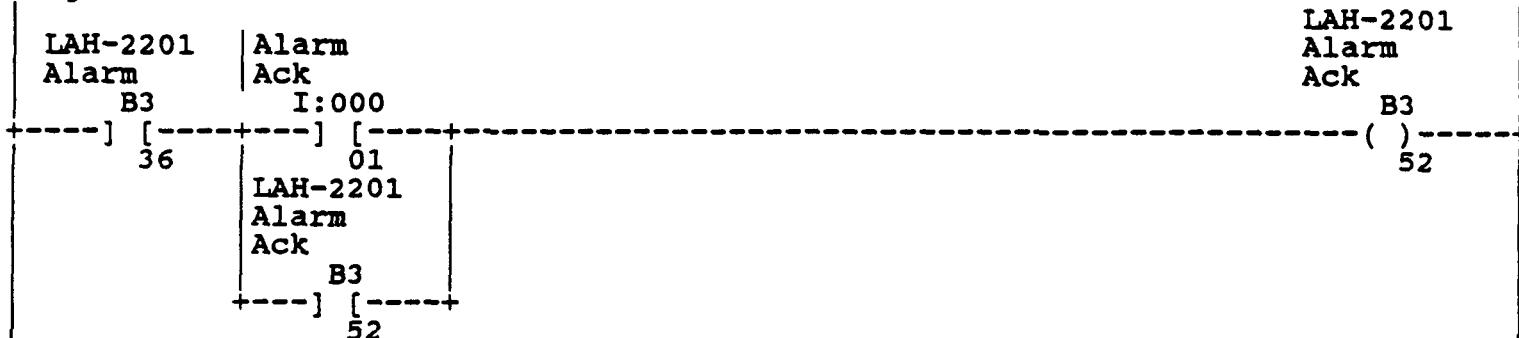
N7:0

-BTW- 2:12  
-FAL- 2:8  
-GRT- 2:31 2:32

N7:67

-GRT- 2:32

Rung 2:33



B3/36

-] [- 2:32 2:33 2:34 2:79  
-( )- 2:32

B3/52

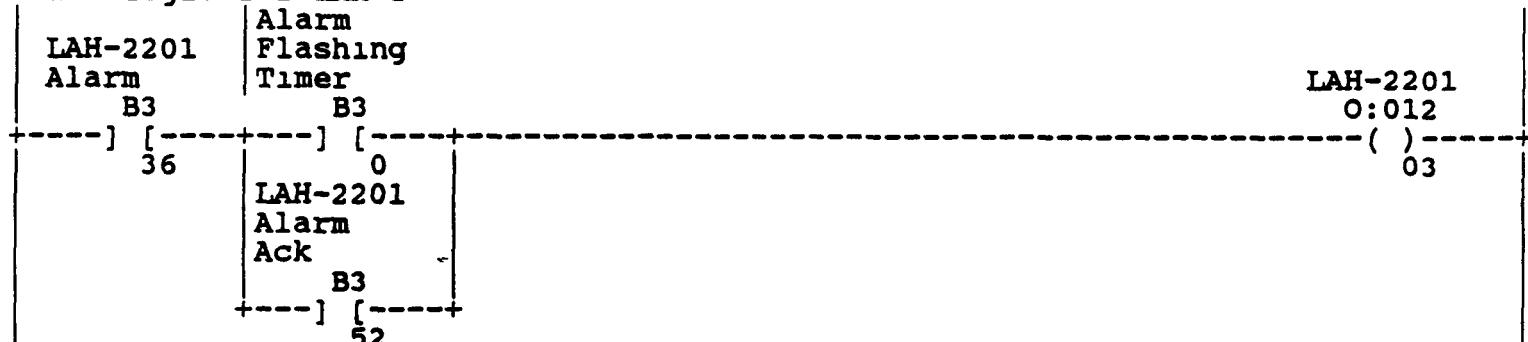
-] [- 2:33 2:34  
-]/[- 2:79  
-( )- 2:33

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:34

Alarm logic for LAH-2



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17

B3/36

-] [- 2:32 2:33 2:34 2:79  
-( )- 2:32

`/52

B3/52

-] [- 2:33 2:34

-]/[- 2:79

-( )- 2:33

O:012/03

-( )- 2:34

Rung 2:35

Alarm logic for TAH-300

TT-300

+GRT-----+

-----+GREATER THAN-----+( )-----

Source A N7:20

584

Source B N7:69

1500

-----+Alarm

Test

I:000

+---] [-----+

02

TAH-300 | Alarm

Alarm | Reset

B3

I:031

---] [-----]/[-----+

37

13

./37

-] [- 2:35 2:36 2:37 2:79

-]/[- 2:86 2:87

-( )- 2:35

I:000/02

-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56

2:59 2:62 2:65 2:68 2:74

I:031/13

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56

2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

N7:20

-GRT- 2:35

N7:69

-GRT- 2:35

Rung 2:36

TAH-300 | Alarm

Alarm | Ack

B3

I:000

---] [-----] [-----+( )-----

37

01

-----+TAH-300

-----+Alarm

-----+Ack

B3

-----+53

/37

TAH-300

Alarm

B3

37

TAH-300

Alarm

Ack

B3

53

B3/37

```
-] [- 2:35 2:36 2:37 2:79
-]/[- 2:86 2:87
-( )- 2:35
```

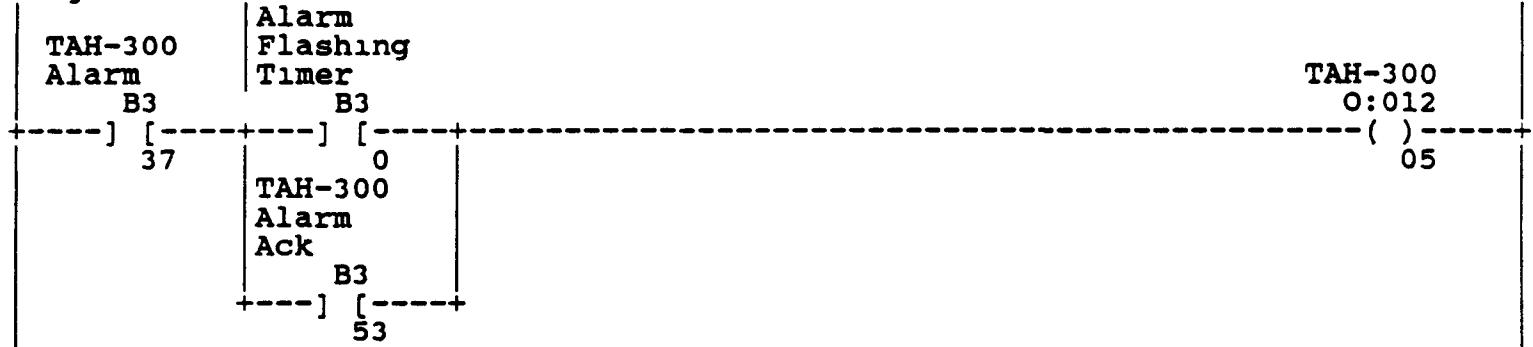
B3/53

```
-] [- 2:36 2:37
-]/[- 2:79
-( )- 2:36
```

I:000/01

```
-] [- 2:19 2:22 2:25 2:29 2:33 2.36 2:39 2:42 2:45 2:48 2:51 2:54 2:57
2:60 2:63 2:66 2:69 2:75
```

Rung 2:37



B3/0

```
-] [- 2:17 2:20 2:23 2:26 2:30 2 34 2:37 2:40 2:43 2:46 2:49 2:52 2:55
2:58 2:61 2:64 2:67 2:70 2:76
-]/[- 2:17
-( )- 2:17
```

B3/37

```
-] [- 2:35 2:36 2:37 2:79
-]/[- 2:86 2:87
-( )- 2:35
```

B3/53

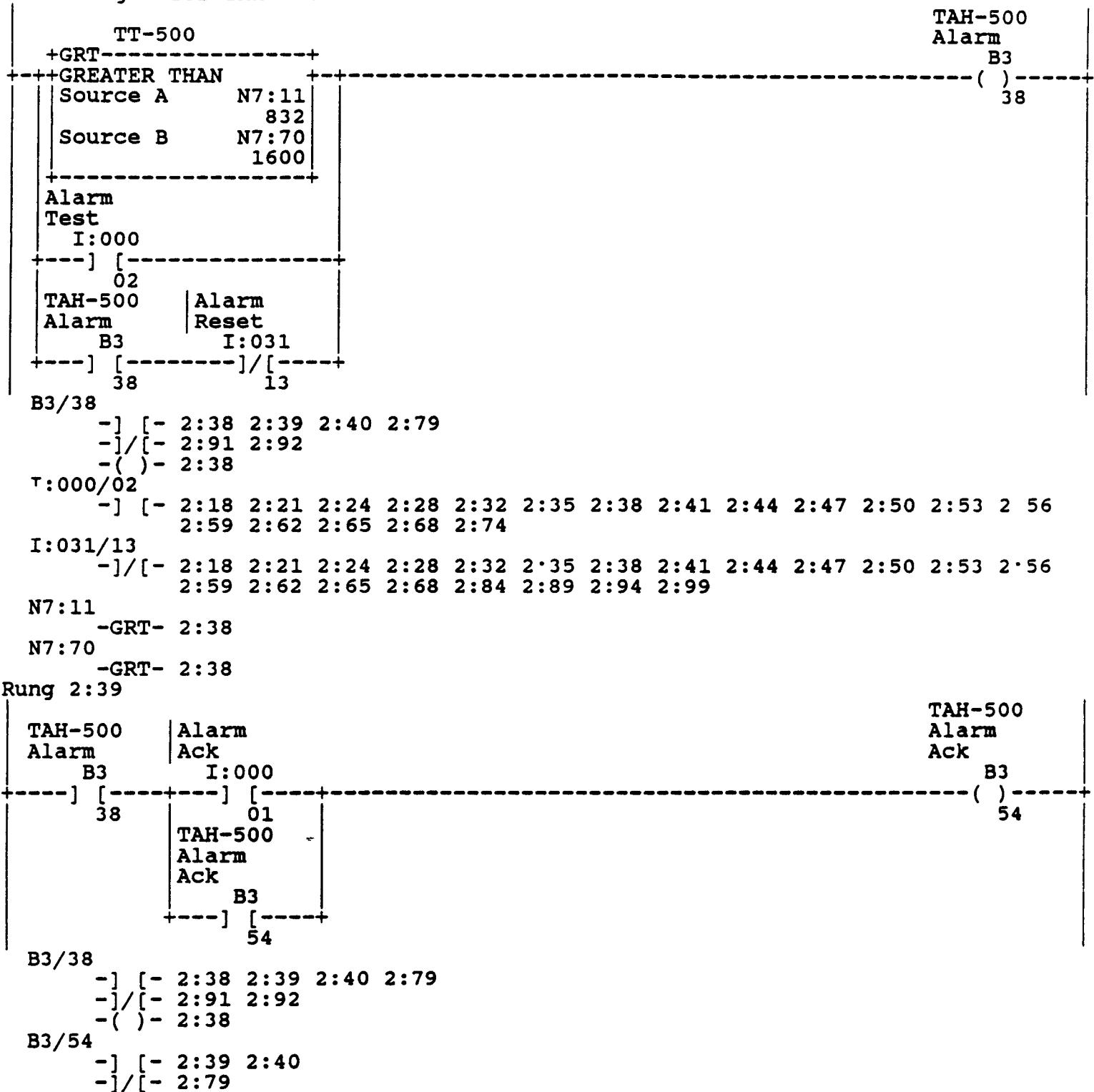
```
-] [- 2:36 2:37
-]/[- 2:79
-( )- 2:36
```

O:012/05

```
-( )- 2:37
```

Rung 2:38

Alarm logic for TAH-500



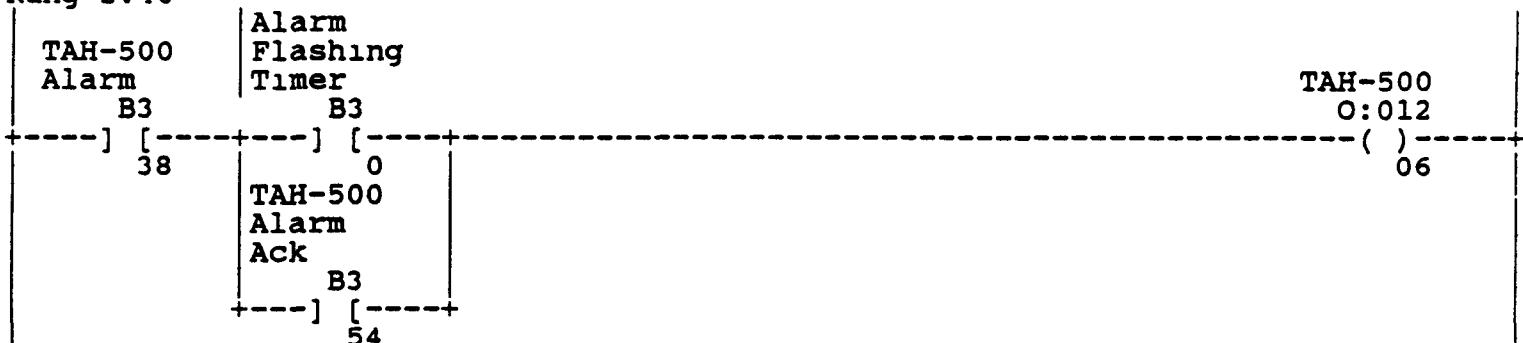
B3/54

-( )- 2:39

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:40



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17

B3/38

-] [- 2:38 2:39 2:40 2:79  
-]/[- 2:91 2:92  
-( )- 2:38

/54

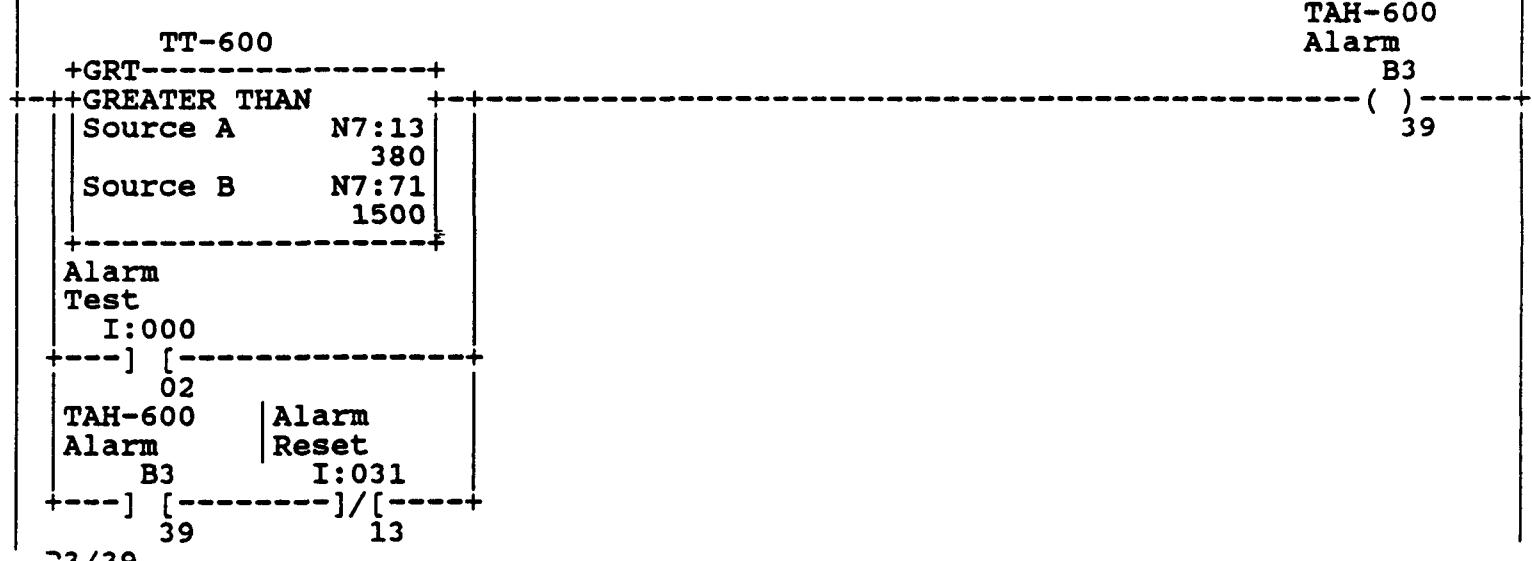
-] [- 2:39 2:40  
-]/[- 2:79  
-( )- 2:39

O:012/06

-( )- 2:40

Rung 2:41

Alarm logic for TAH-600



~3/39

B3/39

-] [- 2:41 2:42 2:43 2:79  
 -]/[- 2:96 2:97  
 -( )- 2:41

I:000/02

-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:74

I:031/13

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

N7:13

-GRT- 2:41

N7:71

-GRT- 2:41

Rung 2:42

TAH-600 | Alarm  
 Alarm | Ack  
 B3 I:000

TAH-600  
 Alarm  
 Ack  
 B3

-----] [-----] [-----]  
 39 01  
 TAH-600  
 Alarm  
 Ack  
 B3  
 -----] [-----]  
 55

( )-----  
 55

/39

-] [- 2:41 2:42 2:43 2:79  
 -]/[- 2:96 2:97  
 -( )- 2:41

B3/55

-] [- 2:42 2:43  
 -]/[- 2:79  
 -( )- 2:42

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
 2:60 2:63 2:66 2:69 2:75

Rung 2:43

TAH-600 | Alarm  
 Alarm | Flashing  
 B3 B3

TAH-600  
 O:012  
 ( )-----  
 07

-----] [-----] [-----]  
 39 0  
 TAH-600  
 Alarm  
 Ack  
 B3  
 -----] [-----]  
 55

B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17

B3/0  
-( )- 2:17

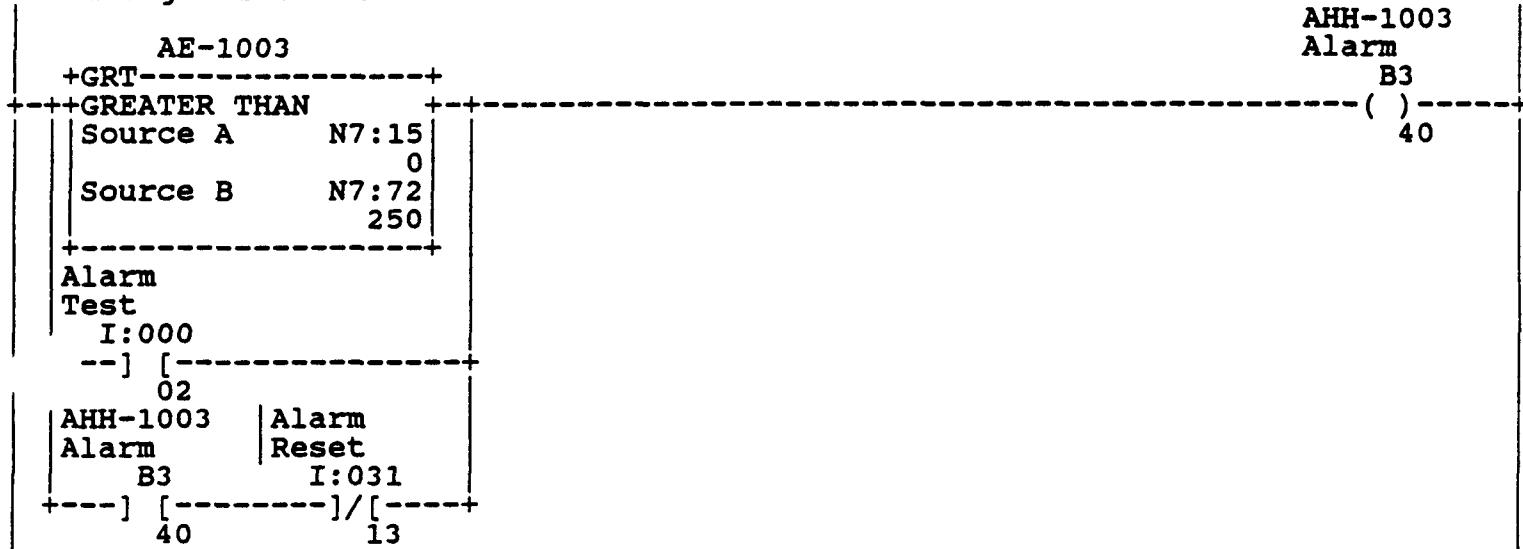
B3/39  
-] [- 2:41 2:42 2:43 2:79  
-]/[- 2:96 2:97  
-( )- 2:41

B3/55  
-] [- 2:42 2:43  
-]/[- 2:79  
-( )- 2:42

O:012/07  
-( )- 2:43

Rung 2:44

Alarm logic for AAH-1003



B3/40  
-] [- 2:44 2:45 2:46 2:77 2:80  
-( )- 2:44

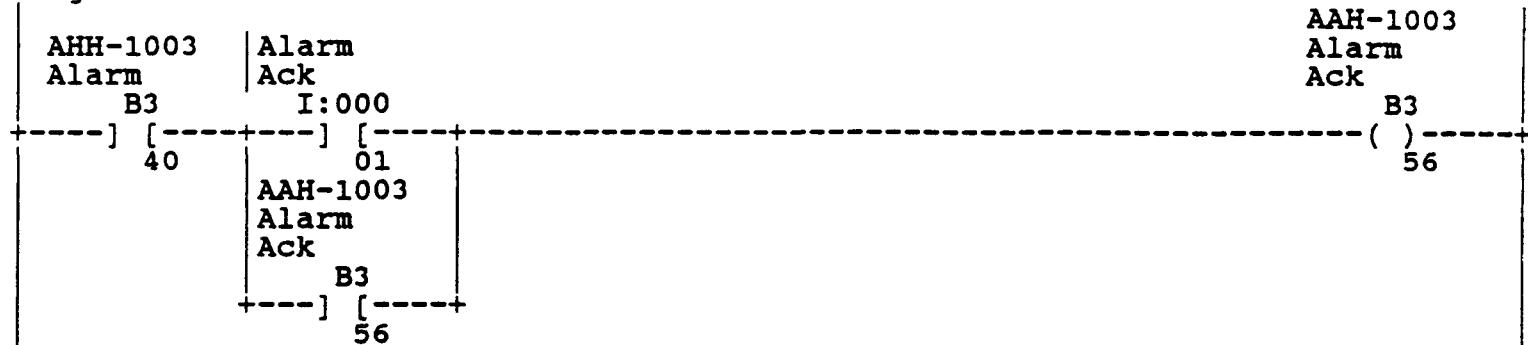
I:000/02  
-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:74

I:031/13  
-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

N7:15  
-GRT- 2:44

N7:72  
-GRT- 2:44

Rung 2:45



B3/40

```
-] [- 2:44 2:45 2:46 2:77 2:80  
-( )- 2:44
```

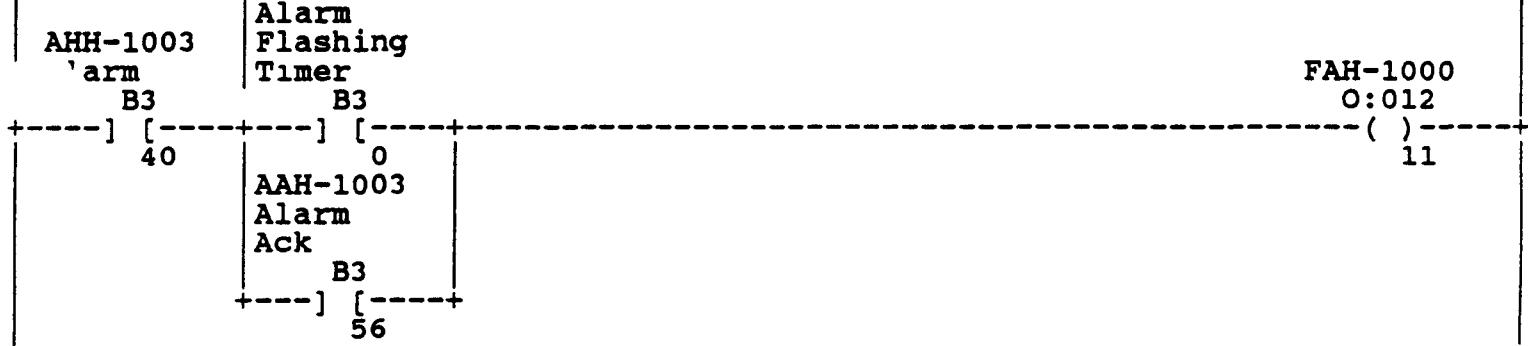
B3/56

```
-] [- 2:45 2:46  
-]/[- 2:80  
-( )- 2:45
```

I:000/01

```
-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75
```

Rung 2:46



B3/0

```
-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17
```

B3/40

```
-] [- 2:44 2:45 2:46 2:77 2:80  
-( )- 2:44
```

B3/56

```
-] [- 2:45 2:46  
-]/[- 2:80  
-( )- 2:45
```

O:012/11

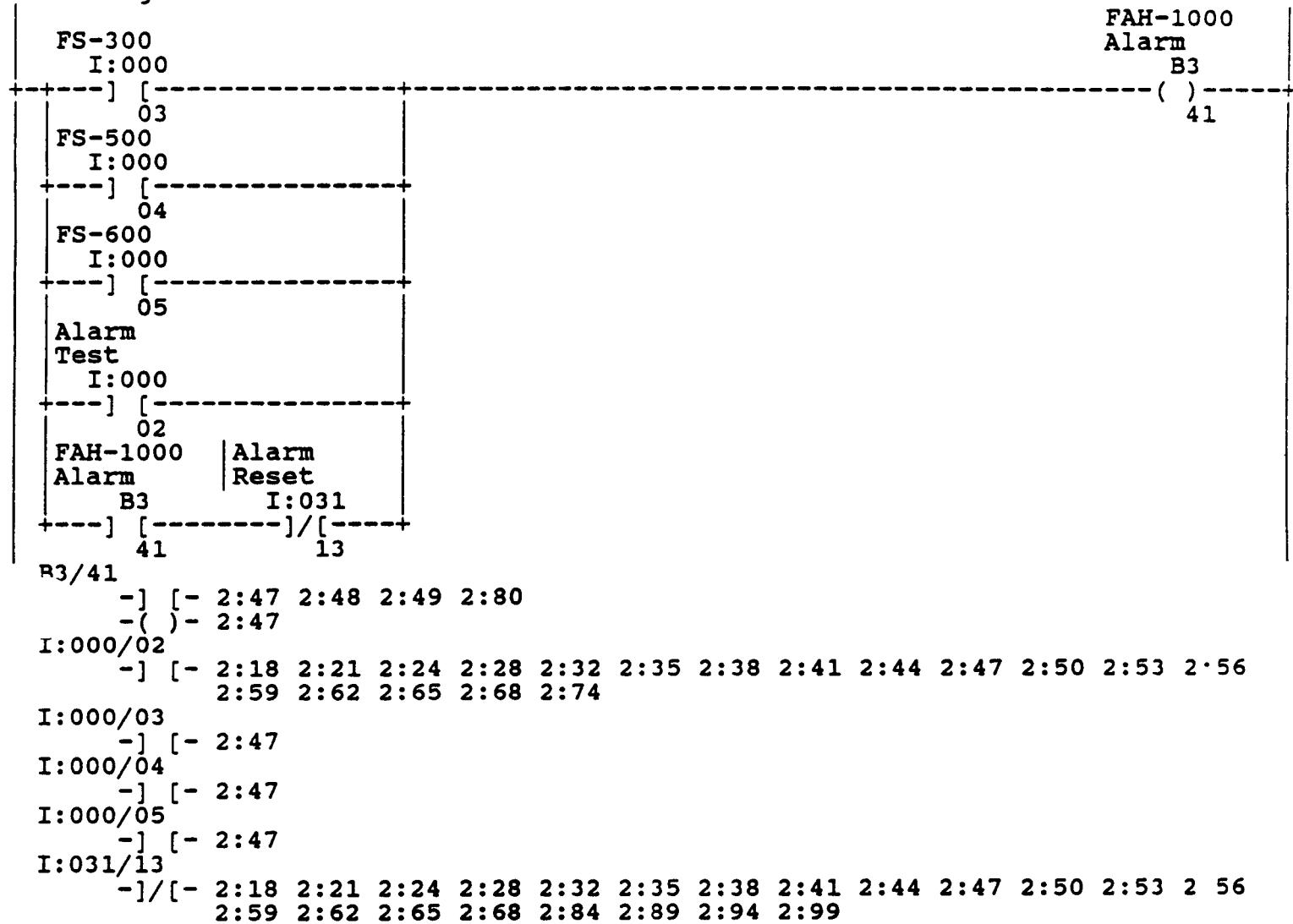
```
-( )- 2:46
```

AAH-1003  
Alarm  
Ack  
B3  
( )  
56

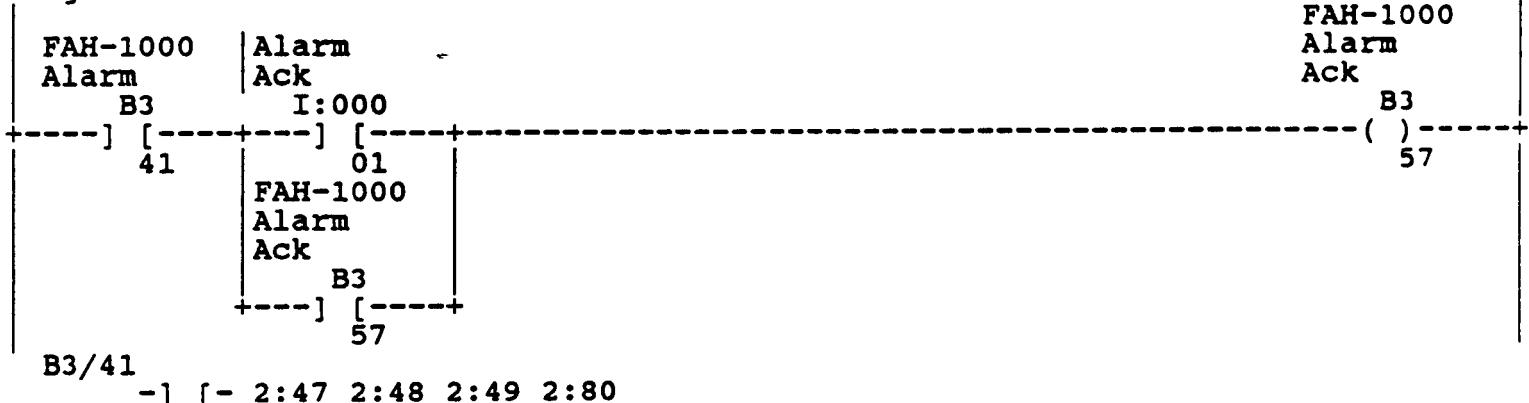
FAH-1000  
O:012  
11

Rung 2:47

Alarm logic for FAH-1000



Rung 2:48

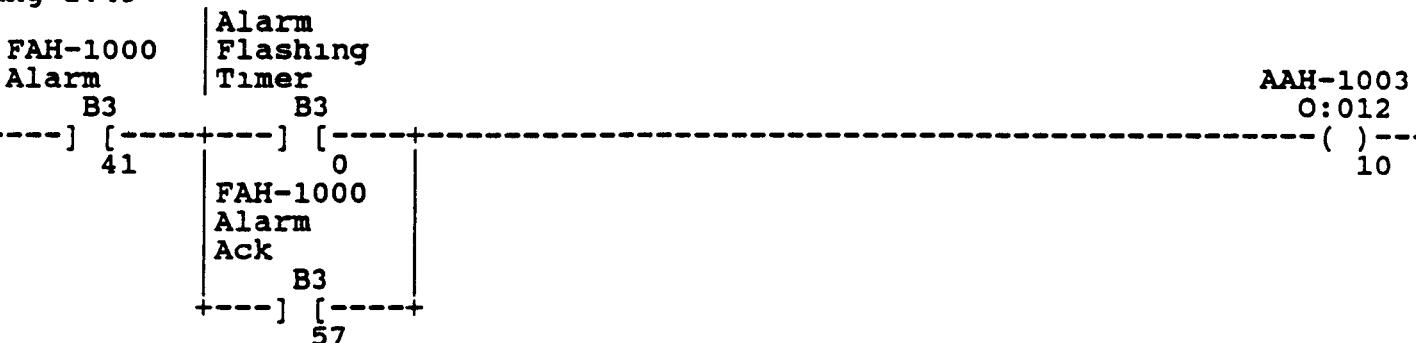


B3/41  
-( )- 2:47

B3/57  
-] [- 2:48 2:49  
-]/[- 2:80  
-( )- 2:48

I:000/01  
-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:49

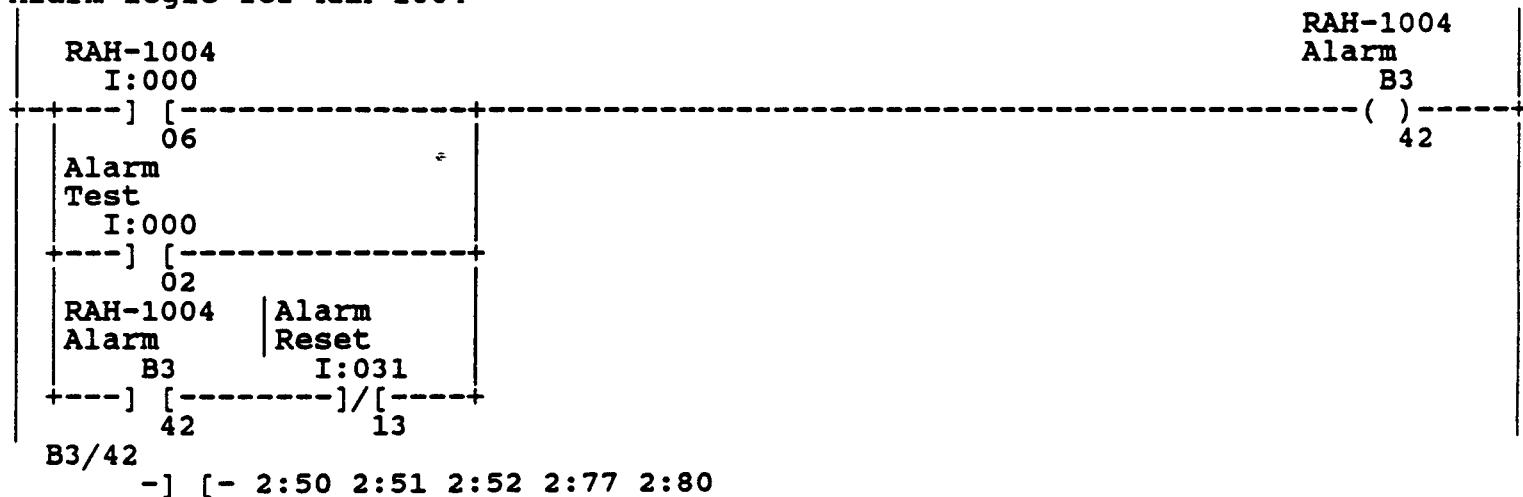


B3/0  
-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17  
/41  
-] [- 2:47 2:48 2:49 2:80  
-( )- 2:47

B3/57  
-] [- 2:48 2:49  
-]/[- 2:80  
-( )- 2:48  
O:012/10  
-( )- 2:49

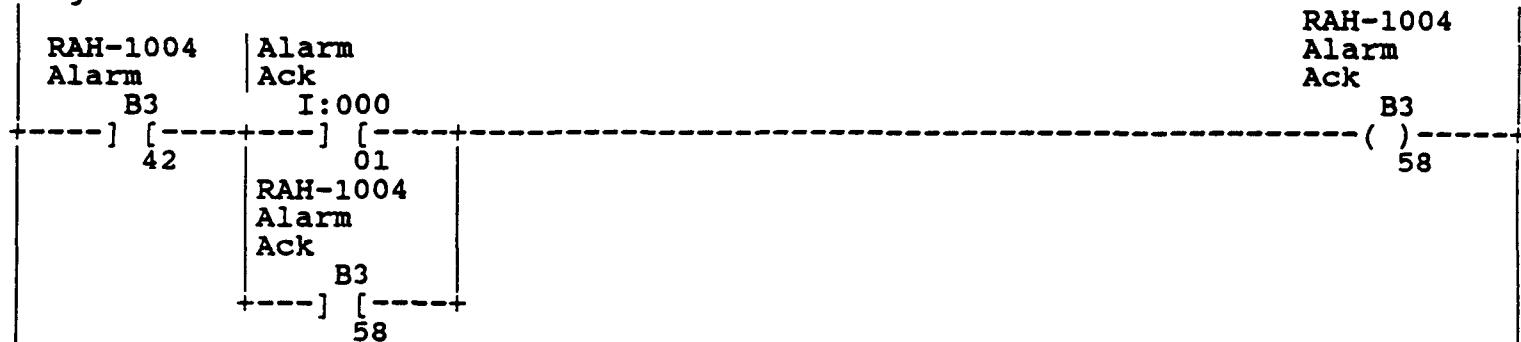
Rung 2:50

Alarm logic for RAH-1004



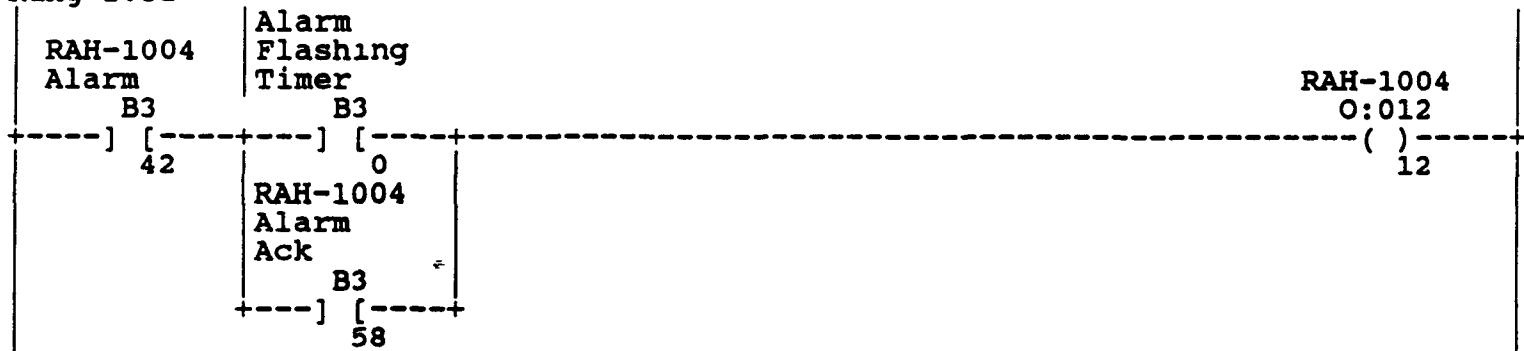
B3/42  
 -( )- 2:50  
 I:000/02  
 -] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:74  
 I:000/06  
 -] [- 2:50  
 I:031/13  
 -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

Rung 2:51



B3/42  
 -] [- 2:50 2:51 2:52 2:77 2:80  
 -( )- 2:50  
 /58  
 -] [- 2:51 2:52  
 -]/[- 2:80  
 -( )- 2:51  
 I:000/01  
 -] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
 2:60 2:63 2:66 2:69 2:75

Rung 2:52



B3/0  
 -] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17  
 -( )- 2:17  
 B3/42  
 -] [- 2:50 2:51 2:52 2:77 2:80  
 -( )- 2:50  
 --/58

## ram Listing Report

PLC-5/15

4 Fe  
File EGGVAP

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GVAP Rung 2:52

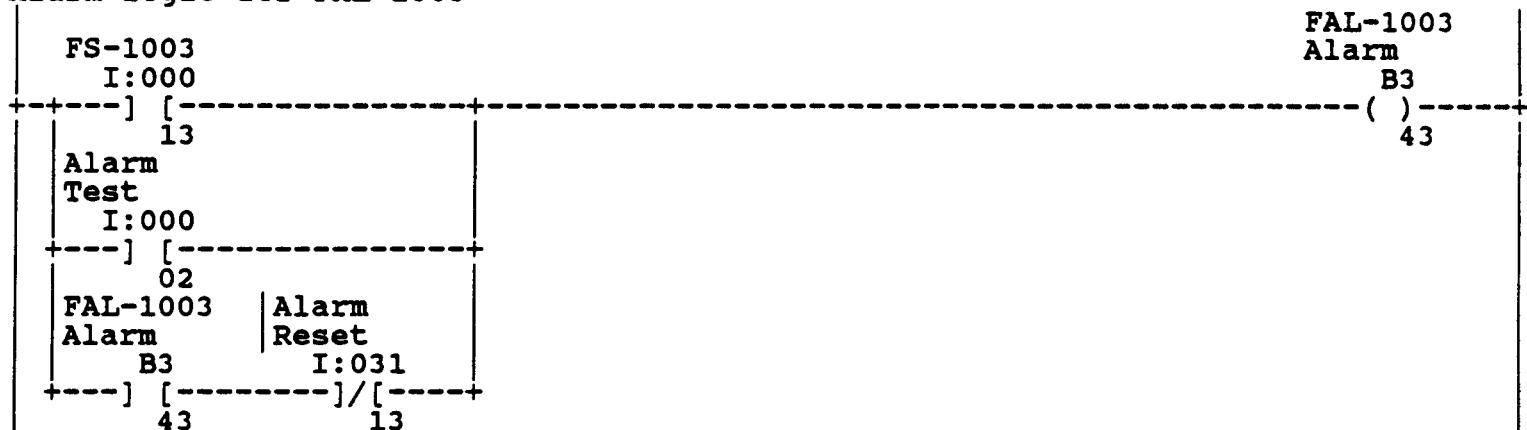
B3 / 58

-] [- 2:51 2:52  
-]/[- 2:80  
-( )- 2:51

0:012/12

- ( ) - 2:52

Rung 2:53  
Alarm logic for FAL-1003



B3 / 43

-] [- 2:53 2:54 2:55 2:80  
-( )- 2:53

000/02

-] [- 2:18 2:21 2:24 2:28 2:32  
2:59 2:62 2:65 2:68 2:74

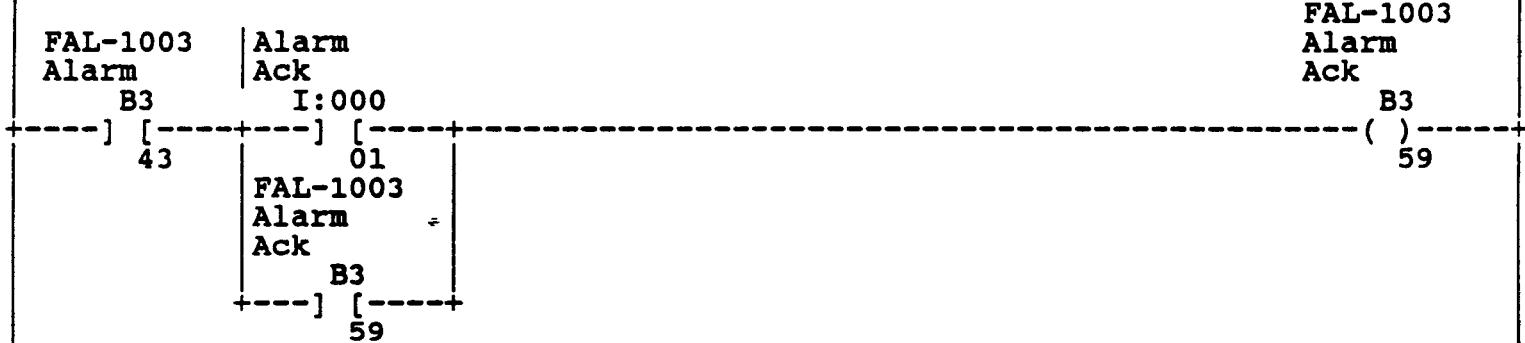
I:000/13

-] [- 2:53

I:031/i3

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

Rung 2:54



B3 / 43

-] [- 2:53 2:54 2:55 2:80  
-( )- 2:53

B3 / 59

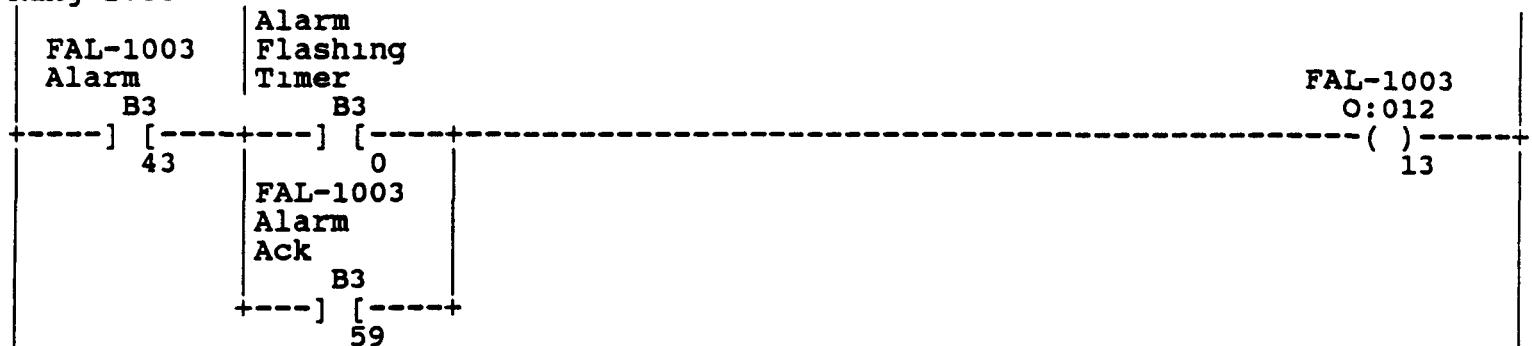
-] [- 2:54 2:55  
-]/[- 2:80  
-( )- 2:54  
/01

## Program Listing Report

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Rung 2:54

I:000/01  
 -] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
 2:60 2:63 2:66 2:69 2:75

Rung 2:55



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17  
 -( )- 2:17

B3/43

-] [- 2:53 2:54 2:55 2:80  
 -( )- 2:53

B3/59

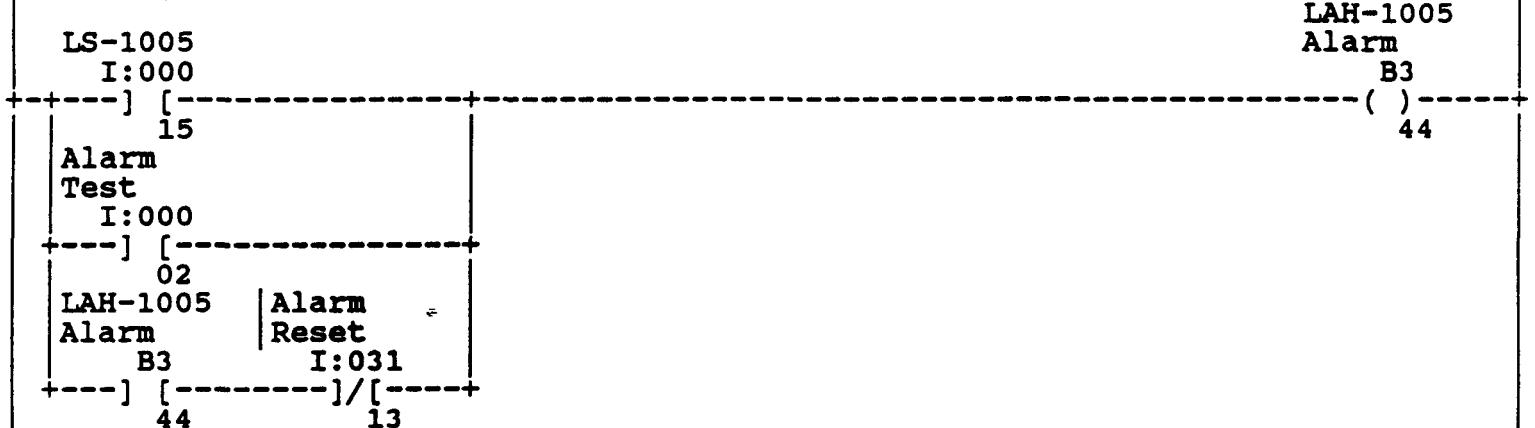
-] [- 2:54 2:55  
 -]/[- 2:80  
 -( )- 2:54

O:012/13

-( )- 2:55

Rung 2:56

Alarm logic for LAH-1005



B3/44

-] [- 2:56 2:57 2:58 2:81  
 -( )- 2:56

I:000/02

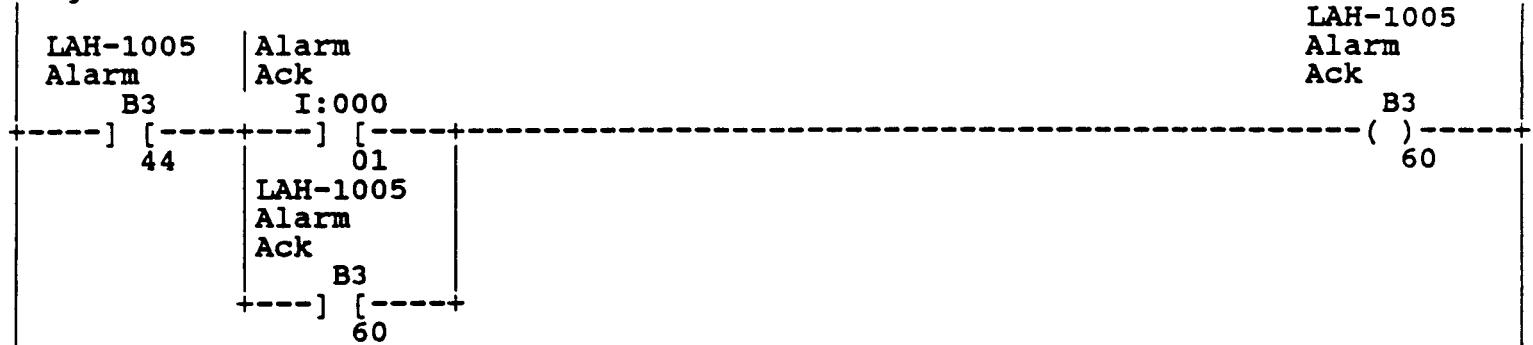
-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:74

I:000/15

-] [- 2:56

I:031/13  
 -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
 2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99

Rung 2:57

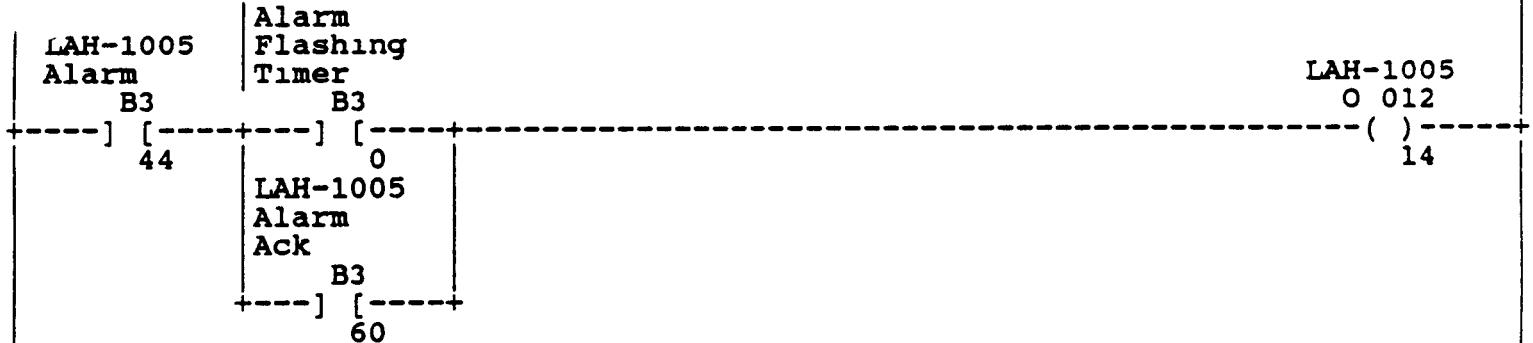


B3/44  
 -] [- 2:56 2:57 2:58 2:81  
 -( )- 2:56

B3/60  
 -] [- 2:57 2:58  
 -]/[- 2:81  
 -( )- 2:57

I:000/01  
 -] [- 2:19 2:22 2:25 2:29 2:33 2 36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
 2:60 2:63 2:66 2:69 2:75

+ 2:58



B3/0  
 -] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17  
 -( )- 2:17

B3/44  
 -] [- 2:56 2:57 2:58 2:81  
 -( )- 2:56

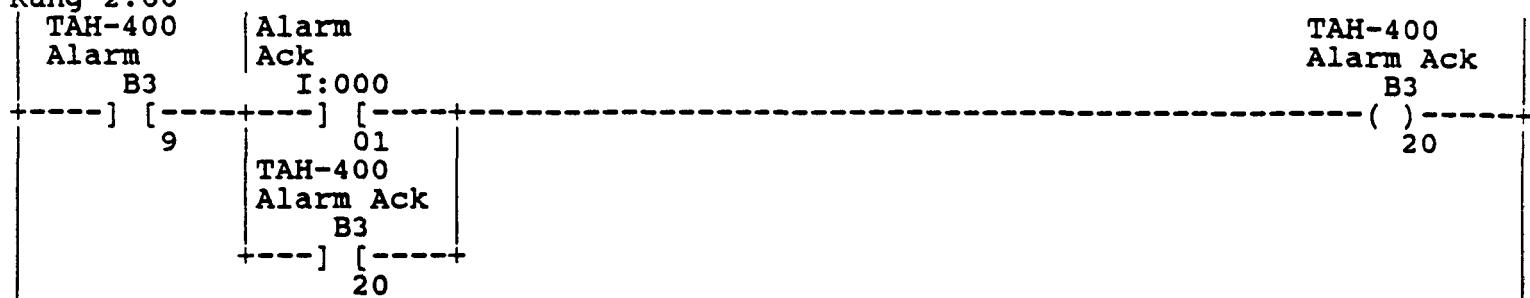
B3/60  
 -] [- 2:57 2:58  
 -]/[- 2:81  
 -( )- 2:57

O:012/14  
 -( )- 2:58

Rung 2:59  
Alarm Logic for TAH-400

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| TT-400A<br>+GRT-----+<br>++GREATER THAN +-----+<br>  Source A N7:40  <br>  200  <br>  Source B N7:82  <br>  2100  <br>+-----+<br><br>TT-400B<br>+GRT-----+<br>++GREATER THAN +-----+<br>  Source A N7:41  <br>  200  <br>  Source B N7:82  <br>  2100  <br>+-----+<br><br>TT-400C<br>+GRT-----+<br>++GREATER THAN +-----+<br>  Source A N7:42  <br>  200  <br>  Source B N7:82  <br>  2100  <br>+-----+<br><br>alarm<br>Test<br>I:000<br>----] [-----+<br>02<br>TAH-400   Alarm<br>Alarm   Reset<br>B3 I:031<br>----] [-----]/[-----+<br>9 13<br><br>B3/9<br>----] [- 2:59 2:60 2:61 2:81<br>-( )- 2:59<br>I:000/02<br>----] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56<br>2:59 2:62 2:65 2:68 2:74<br>I:031/13<br>----]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56<br>2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99<br><br>N7:40<br>-GRT- 2:59 2:65<br>N7:41<br>-GRT- 2:59 2:65<br>N7:42<br>-GRT- 2:59 2:65<br>N7:82<br>-GRT- 2:59 2:59 2:59 2:62 2:62 2:62 | TAH-400<br>Alarm<br>B3<br>( )-----+<br>9 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|

Rung 2:60



B3/9

-] [- 2:59 2:60 2:61 2:81  
-( )- 2:59

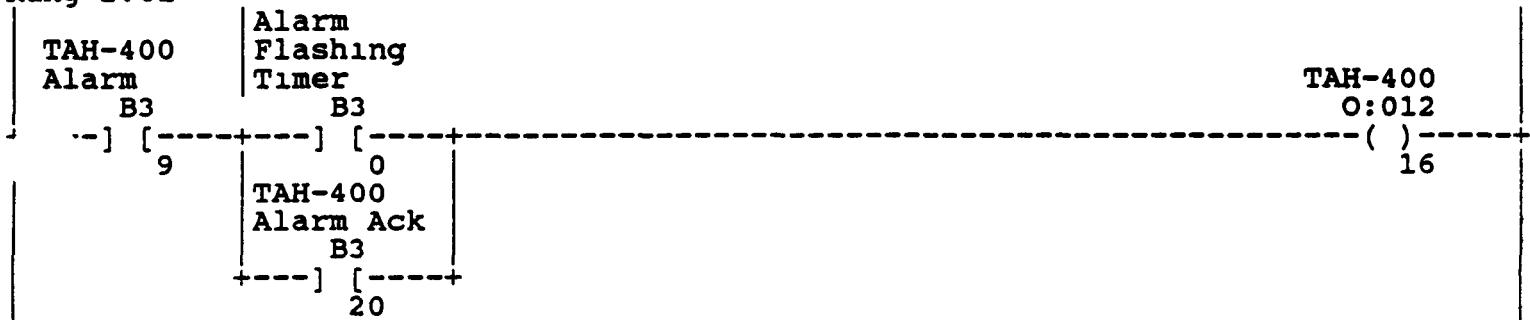
B3/20

-] [- 2:60 2:61  
-]/[- 2:81  
-( )- 2:60

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:61



B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17

B3/9

-] [- 2:59 2:60 2:61 2:81  
-( )- 2:59

B3/20

-] [- 2:60 2:61  
-]/[- 2:81  
-( )- 2:60

O:012/16

-( )- 2:61

Rung 2:62

Alarm Logic for TAH-410

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <pre>         TT-410A +GRT-----+ ++GREATER THAN   Source A    N7:43               200   Source B    N7:82               2100 +-----+         TT-410B +GRT-----+ ++GREATER THAN   Source A    N7:44               200   Source B    N7:82               2100 +-----+         TT-410C +GRT-----+ ++GREATER THAN   Source A    N7:45               200   Source B    N7:82               2100 +-----+         larm Test   I:000 +---] [-----]       02 TAH-410   Alarm Alarm     Reset   B3      I:031 +---] [-----]/[-----]       10      13 B3/10   -] [- 2:62 2:63 2:64 2:81   -( )- 2:62 I:000/02   -] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56       2:59 2:62 2:65 2:68 2:74 I:031/13   -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56       2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99 N7:43   -GRT- 2:62 2:68 N7:44   -GRT- 2:62 2:68 N7:45   -GRT- 2:62 2:68 N7:82   -GRT- 2:59 2:59 2:59 2:62 2:62 2:62 </pre> | TAH-410         Alarm         B3         ( )         10 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|

## Program Listing Report

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PLC-5/15 File EGGVAP Rung 2:63

Rung 2:63

|         |           |           |
|---------|-----------|-----------|
| TAH-410 | Alarm     | TAH-410   |
| Alarm   | Ack       | Alarm Ack |
| B3      | I:000     | B3        |
| -----]  | [-----]   | ( )-----  |
| 10      | 01        | 21        |
|         | TAH-410   |           |
|         | Alarm Ack |           |
|         | B3        |           |
| -----]  | [-----]   |           |
|         | 21        |           |

B3/10

|        |      |      |      |      |
|--------|------|------|------|------|
| -] [ - | 2:62 | 2:63 | 2:64 | 2:81 |
| -(- )- | 2:62 |      |      |      |

B3/21

|        |      |      |
|--------|------|------|
| -] [ - | 2:63 | 2:64 |
| -]/[ - | 2:81 |      |
| -(- )- | 2:63 |      |

I:000/01

|        |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| -] [ - | 2:19 | 2:22 | 2:25 | 2:29 | 2:33 | 2:36 | 2.39 | 2:42 | 2:45 | 2:48 | 2:51 | 2:54 | 2:57 |  |
|        | 2:60 | 2:63 | 2:66 | 2:69 | 2:75 |      |      |      |      |      |      |      |      |  |

Rung 2:64

|         |           |          |
|---------|-----------|----------|
| TAH-410 | Alarm     | TAH-410  |
| Alarm   | Flashing  | O:013    |
| B3      | Timer     |          |
| -----]  | [-----]   | ( )----- |
| 10      | 0         | 00       |
|         | TAH-410   |          |
|         | Alarm Ack |          |
|         | B3        |          |
| -----]  | [-----]   |          |
|         | 21        |          |

B3/0

|        |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| -] [ - | 2:17 | 2:20 | 2:23 | 2:26 | 2:30 | 2:34 | 2:37 | 2:40 | 2:43 | 2:46 | 2:49 | 2:52 | 2:55 |
|        | 2:58 | 2:61 | 2:64 | 2:67 | 2:70 | 2:76 |      |      |      |      |      |      |      |
| -]/[ - | 2:17 |      |      |      |      |      |      |      |      |      |      |      |      |
| -(- )- | 2:17 |      |      |      |      |      |      |      |      |      |      |      |      |

B3/10

|        |      |      |      |      |
|--------|------|------|------|------|
| -] [ - | 2:62 | 2:63 | 2:64 | 2:81 |
| -(- )- | 2:62 |      |      |      |

B3/21

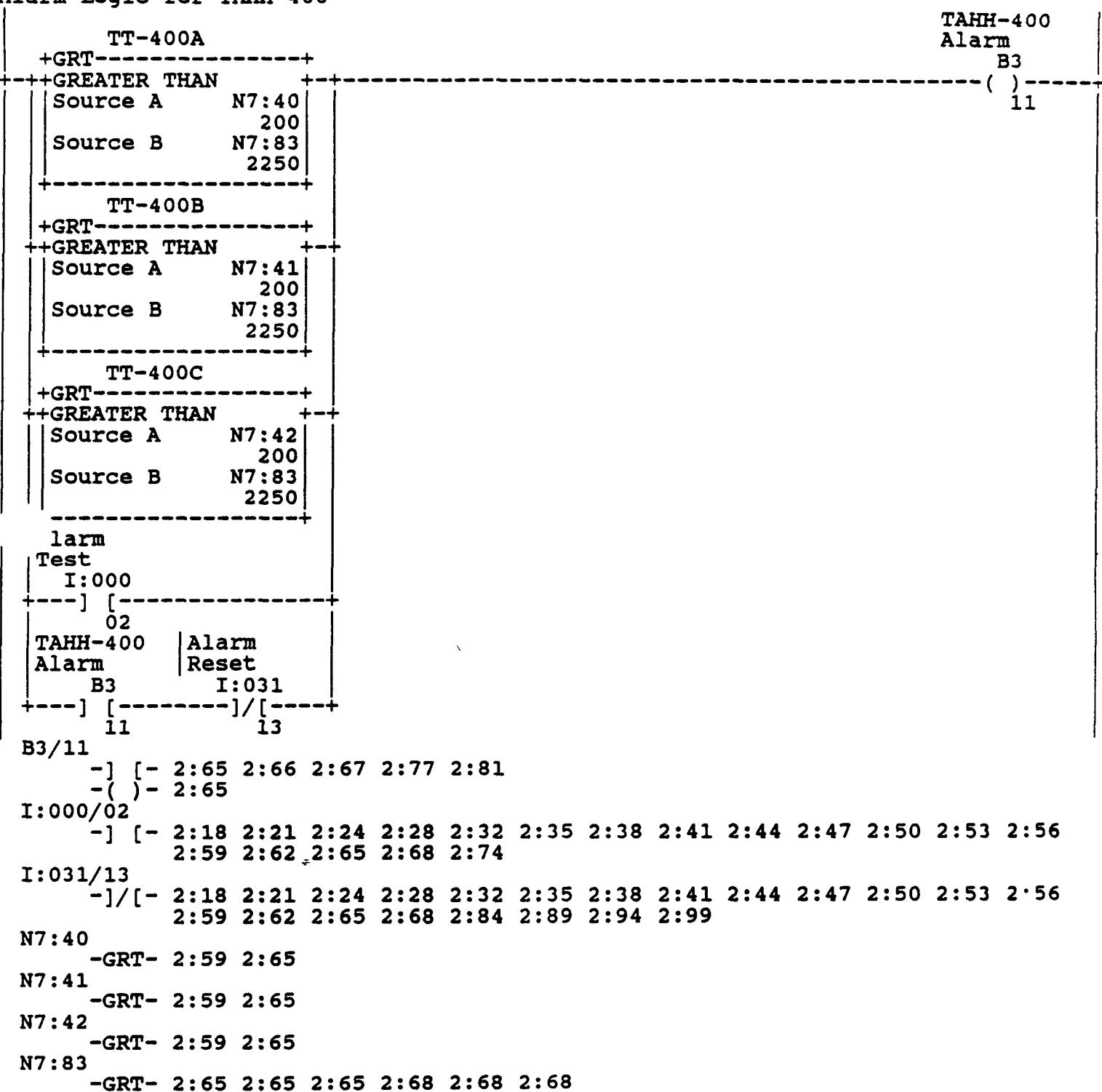
|        |      |      |
|--------|------|------|
| -] [ - | 2:63 | 2:64 |
| -]/[ - | 2:81 |      |
| -(- )- | 2:63 |      |

O:013/00

|        |      |
|--------|------|
| -(- )- | 2:64 |
|--------|------|

Rung 2:65

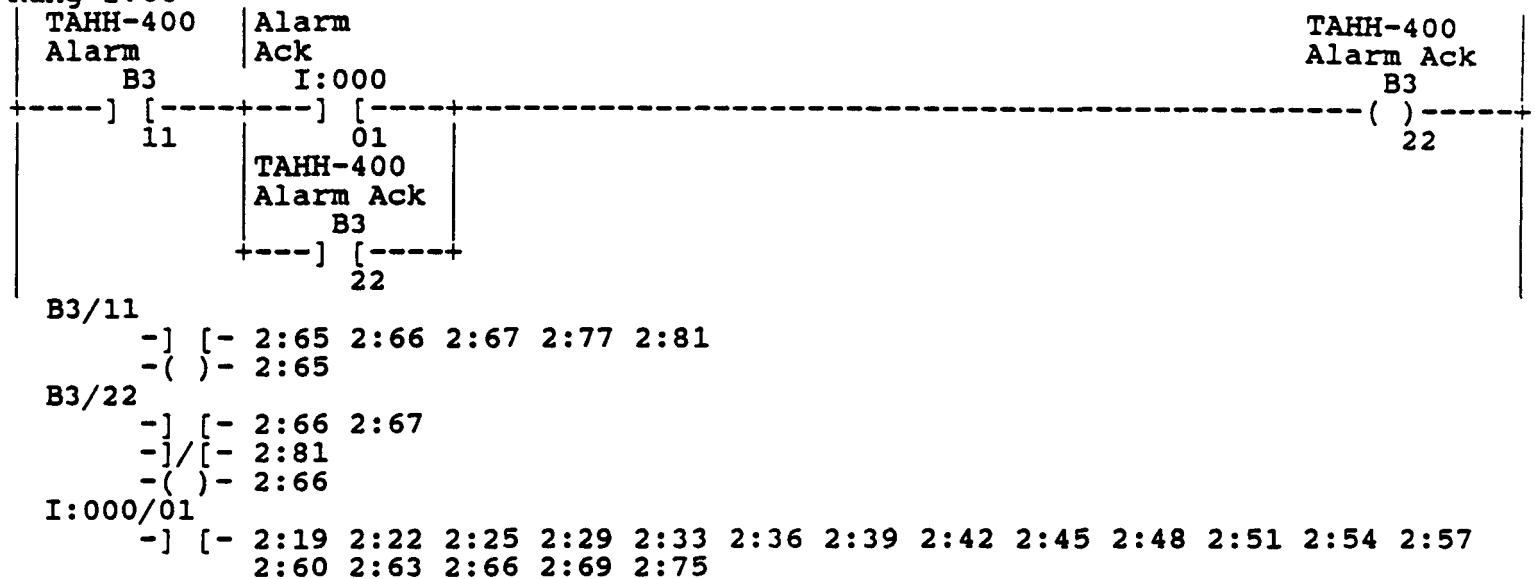
Alarm Logic for TAHH-400



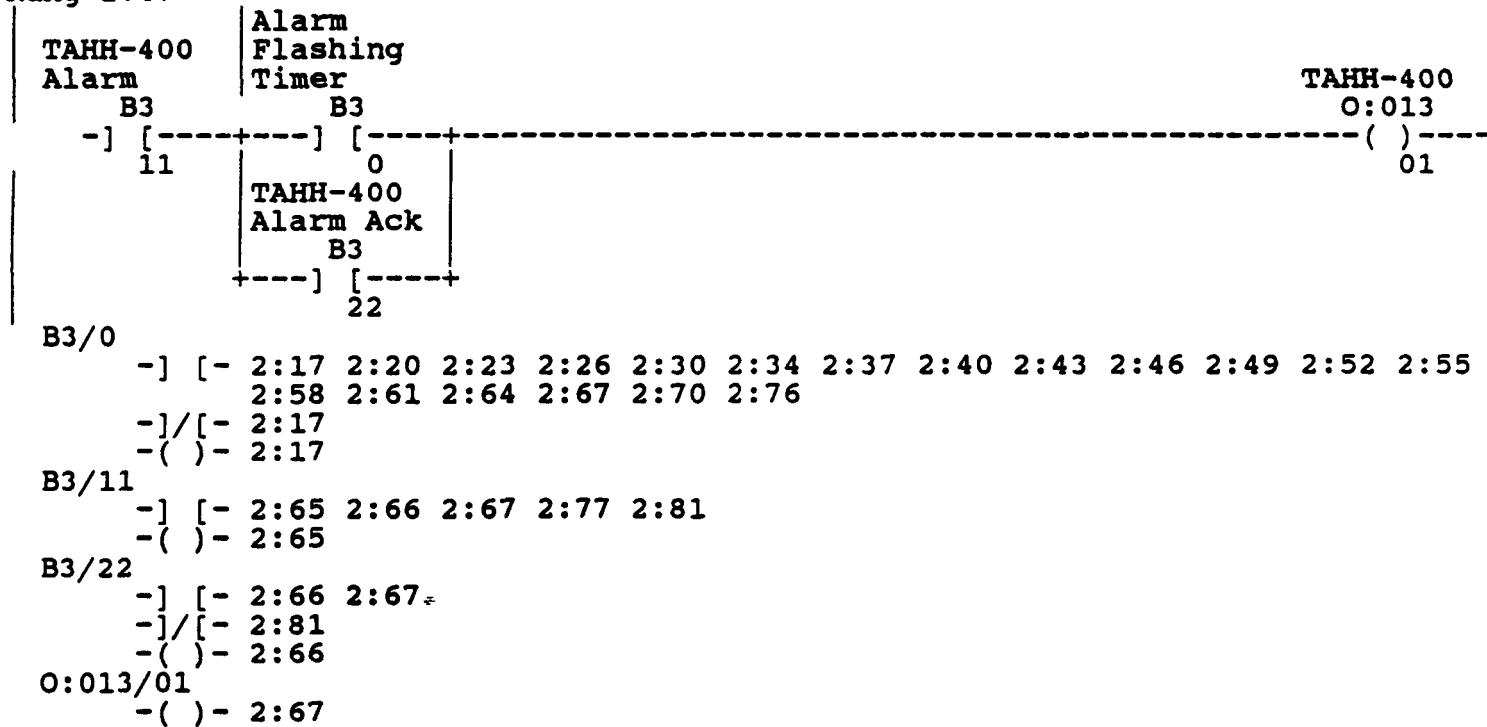
## Program Listing Report

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PLC-5/15 File EGGVAP Rung 2:66

Rung 2:66

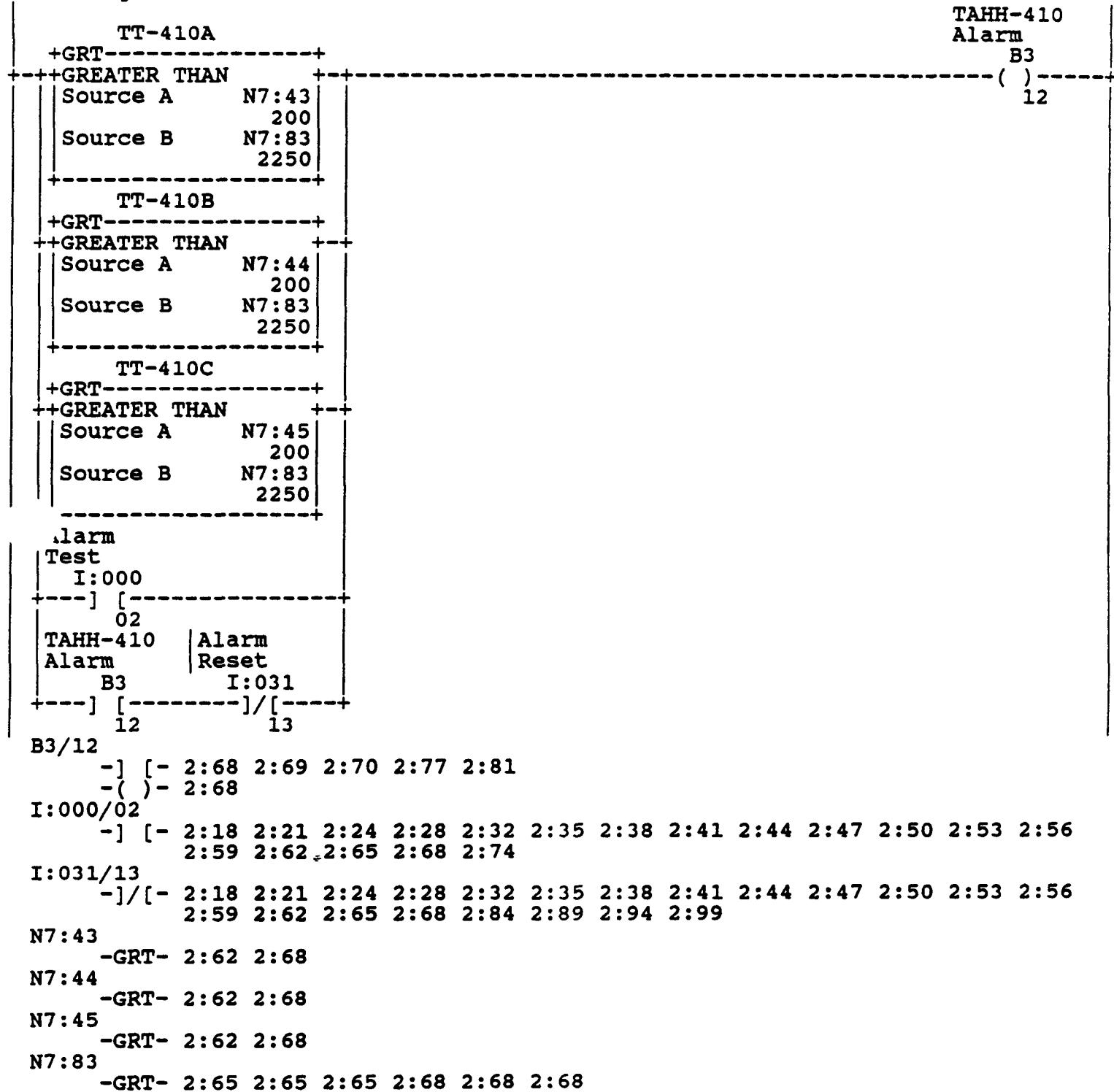


Rung 2:67

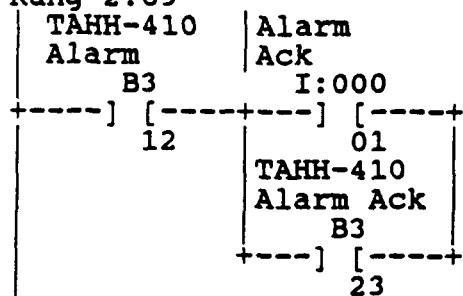


Rung 2:68

Alarm Logic for TAHH-410



Rung 2:69



TAHH-410  
Alarm Ack  
B3  
( )-----  
23

B3/12

-] [- 2:68 2:69 2:70 2:77 2:81  
-( )- 2:68

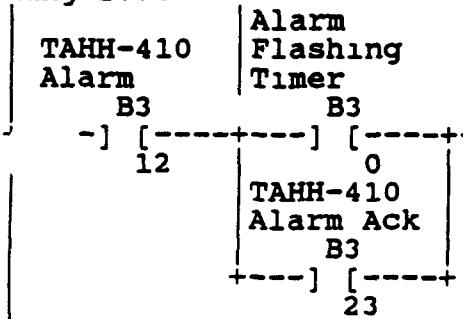
B3/23

-] [- 2:69 2:70  
-]/[- 2:81  
-( )- 2:69

I:000/01

-] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
2:60 2:63 2:66 2:69 2:75

Rung 2:70



TAHH-410  
O:013  
( )-----  
02

B3/0

-] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
2:58 2:61 2:64 2:67 2:70 2:76  
-]/[- 2:17  
-( )- 2:17

B3/12

-] [- 2:68 2:69 2:70 2:77 2:81  
-( )- 2:68

B3/23

-] [- 2:69 2:70  
-]/[- 2:81  
-( )- 2:69  
O:013/02  
-( )- 2:70

Rung 2:71

FID Alarm Logic for High VOC

Select Sampling Location

FID Select  
Ext Vapor

I:031

-----] [-----  
16  
031/16

FID Select  
Ext Vapor  
O:031  
(L)-----  
07

26

## Program Listing Report

PLC-5/15

File EGGVAP

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Rung 2:71

I:031/16  
 -] [- 2:71  
 O:031/07  
 -] [- 2:73 2:74  
 -]/[- 2:73 2:74  
 -(L)- 2:71  
 -(U)- 2:72

Rung 2:72

|                 |            |
|-----------------|------------|
| FID Select      | FID Select |
| GAC Feed        | Ext Vapor  |
| I:031           | O:031      |
| -] [-----       | (U) -----  |
| 17              | 07         |
| I:031/17        |            |
| -] [- 2:72      |            |
| O:031/07        |            |
| -] [- 2:73 2:74 |            |
| -]/[- 2:73 2:74 |            |
| -(L)- 2:71      |            |
| -(U)- 2:72      |            |

Rung 2:73

## Alarm/Shutdown Logic for AAHH-1006

|                           |           |
|---------------------------|-----------|
| FID Select                | AAH-1006  |
| Ext Vapor                 | Shut down |
| O:031                     | O:031     |
| -] [-----                 | ( ) ----- |
| 07                        | 11        |
| +GRT-----+                |           |
| +-----+GREATER THAN       |           |
| Source A N7:39            |           |
| 0                         |           |
| Source B N7:85            |           |
| 30                        |           |
| +-----+                   |           |
| FID Select                |           |
| Ext Vapor                 |           |
| O:031                     |           |
| +GRT-----+                |           |
| +-----+GREATER THAN       |           |
| 07                        |           |
| Source A N7:39            |           |
| 0                         |           |
| Source B N7:87            |           |
| 35                        |           |
| +-----+                   |           |
| AAH-1006   FID Alarm      |           |
| Shut down   Reset         |           |
| O:031 I:032 =             |           |
| -] [-----]/[-----+        |           |
| 11 00                     |           |
| I:032/00                  |           |
| -]/[- 2:73 2:74           |           |
| N7:39                     |           |
| -GRT- 2:73 2:73 2:74 2:74 |           |
| N7:85                     |           |
| -GRT- 2:73                |           |
| N7:87                     |           |
| -GRT- 2:73                |           |
| O:031/07                  |           |
| -] [- 2:73 2:74           |           |

O:031/07  
-]/[- 2:73 2:74  
-(L)- 2:71  
-(U)- 2:72  
O:031/11  
-] [- 2:73 2:74 2:77  
-( )- 2:73

Rung 2:74

## Alarm Logic for AAH-1006

## FID Select

**Ext Vapor**      **FID**

O:031 +GRT-----+  
+-----] [-----+GREATER THAN +  
07 | Source A N7:39  
| 0  
| Source B N7:84  
| 40

**AAH-1006**  
**Alarm**  
**O:031**  
----( )----  
10

```

FID Select
Ext Vapor FID
O:031 +GRT-----+
----]/[----+GREATER THAN ++
    07 |Source A      N7:39 |
          |                      0 |
          |Source B      N7:86 |
          |                      25 |
-----+

```

```
AH-1006  
Shut down  
O:031  
--- ] [ -----  
     11  
Alarm  
Test  
I:000  
--- ] [ -----  
     02  
AAH-1006 | FID Alarm  
Alarm      | Reset  
O:031     I:032  
--- ] [ ----- ] / [ -----
```

10 00  
I:000/02 =  
-] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:74  
I:032/00  
-]/[- 2:73 2:74  
N7:39  
-GRT- 2:73 2:73 2:74 2:74  
N7:84  
-GRT- 2:74  
N7:86  
-GRT- 2:74  
O:031/07  
-] [- 2:73 2:74

## Program Listing Report

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 PLC-5/15 File EGGVAP Rung 2:74

O:031/07  
 -]/[- 2:73 2:74  
 -(L)- 2:71  
 -(U)- 2:72  
 O:031/10  
 -] [- 2:74 2:75 2:76 2:81  
 -( )- 2:74  
 O:031/11  
 -] [- 2:73 2:74 2:77  
 -( )- 2:73

Rung 2:75

|          |           |
|----------|-----------|
| AAH-1006 | Alarm     |
| Alarm    | Ack       |
| O:031    | I:000     |
| -----]   | [-----]   |
| 10       | 01        |
|          | AAH-1006  |
|          | Alarm Ack |
|          | B3        |
| -----]   | [-----]   |
|          | 62        |

AAH-1006  
 Alarm Ack  
 B3  
 -----( )-----  
 62

B3/62  
 -] [- 2:75 2:76  
 -]/[- 2:81  
 -( )- 2:75

T:000/01  
 -] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57  
 2:60 2:63 2:66 2:69 2:75

O:031/10  
 -] [- 2:74 2:75 2:76 2:81  
 -( )- 2:74

Rung 2:76

|          |           |
|----------|-----------|
| AAH-1006 | Alarm     |
| Alarm    | Flashing  |
| O:031    | Timer     |
| -----]   | [-----]   |
| 10       | B3        |
|          | 0         |
|          | AAH-1006  |
|          | Alarm Ack |
|          | B3        |
| -----]   | [-----]   |
|          | 62        |

AAH-1006  
 O:012  
 -----( )-----  
 15

B3/0  
 -] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55  
 2:58 2:61 2:64 2:67 2:70 2:76  
 -]/[- 2:17  
 -( )- 2:17

B3/62  
 -] [- 2:75 2:76  
 -]/[- 2:81  
 -( )- 2:75

O:012/15  
 -( )- 2:76  
 O:031/10

27

O:031/10  
-] [- 2:74 2:75 2:76 2:81  
-( )- 2:74

Rung 2:77

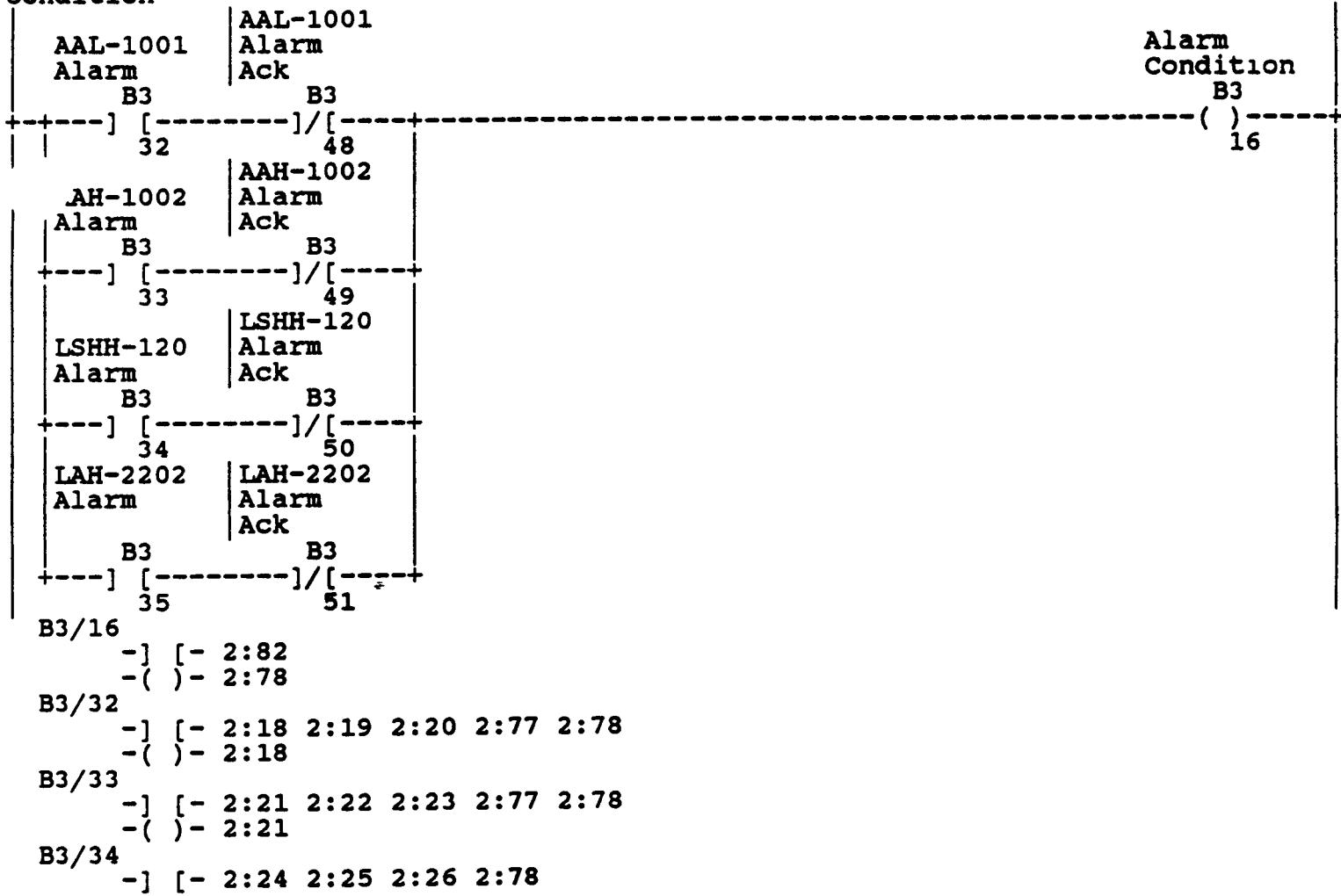
Sets bit B3/19 in the event of a system shut down condition

| AAH-1002<br>Alarm<br>B3                                                                           | System<br>Shut-down<br>B3<br>( )-----<br>19 |
|---------------------------------------------------------------------------------------------------|---------------------------------------------|
| -----]                                                                                            |                                             |
| 33<br>AHH-1003<br>Alarm<br>B3                                                                     |                                             |
| -----]                                                                                            |                                             |
| 40<br>MCR<br>I:000                                                                                |                                             |
| -----]/[-----                                                                                     |                                             |
| 00<br>TAHH-400<br>Alarm<br>B3                                                                     |                                             |
| -----]                                                                                            |                                             |
| 11<br>TAHH-410<br>Alarm<br>B3                                                                     |                                             |
| --]                                                                                               |                                             |
| 12<br>AAH-1006<br>Shut down<br>O:031                                                              |                                             |
| -----]                                                                                            |                                             |
| 11<br>AAL-1001<br>Alarm<br>B3                                                                     |                                             |
| -----]                                                                                            |                                             |
| 32<br>RAH-1004<br>Alarm<br>B3                                                                     |                                             |
| -----]                                                                                            |                                             |
| 42<br>B3/11<br>-] [- 2:65 2:66 2:67 2:77 2:81<br>-( )- 2:65                                       |                                             |
| -----]                                                                                            |                                             |
| B3/12<br>-] [- 2:68 2:69 2:70 2:77 2:81<br>-( )- 2:68                                             |                                             |
| -----]                                                                                            |                                             |
| B3/19<br>-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122<br>2:123<br>-( )- 2:77 |                                             |
| -----]                                                                                            |                                             |
| ~3/32                                                                                             |                                             |

B3/32  
 -] [- 2:18 2:19 2:20 2:77 2:78  
 -( )- 2:18  
 B3/33  
 -] [- 2:21 2:22 2:23 2:77 2:78  
 -( )- 2:21  
 B3/40  
 -] [- 2:44 2:45 2:46 2:77 2:80  
 -( )- 2:44  
 B3/42  
 -] [- 2:50 2:51 2:52 2:77 2:80  
 -( )- 2:50  
 I:000/00  
 -]/[- 2:77  
 O:031/11  
 -] [- 2:73 2:74 2:77  
 -( )- 2:73

Rung 2:78

The next five rungs activate the alarm horn upon an unacknowledged alarm condition



B3/34      -]/[- 2:86 2:87 2:91 2:92  
               -( )- 2:24

B3/35      -] [- 2:28 2:29 2:30 2:78  
               -( )- 2:28

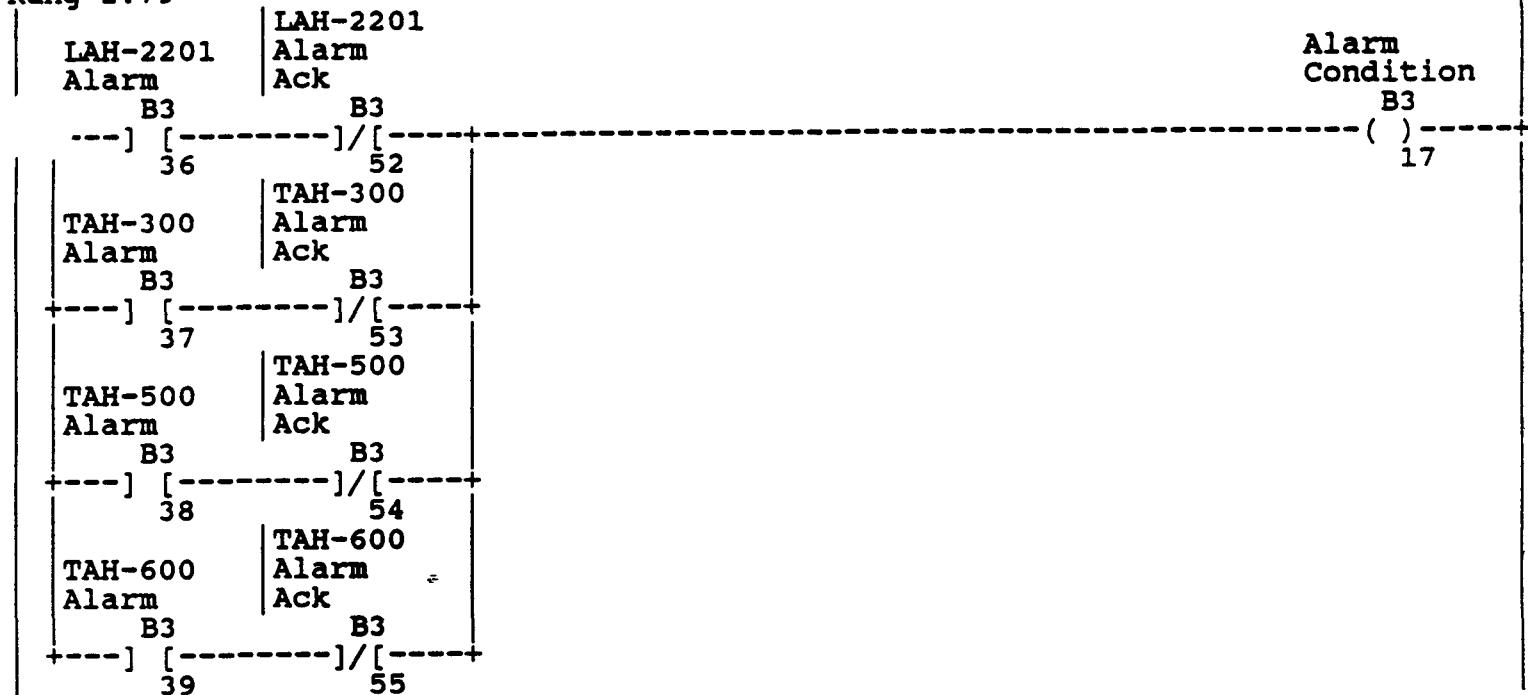
B3/48      -] [- 2:19 2:20  
               -]/[- 2:78  
               -( )- 2:19

B3/49      -] [- 2:22 2:23  
               -]/[- 2:78  
               -( )- 2:22

B3/50      -] [- 2:25 2:26  
               -]/[- 2:78  
               -( )- 2:25

B3/51      -] [- 2:29 2:30  
               -]/[- 2:78  
               -( )- 2:29

Rung 2:79



B3/17      -] [- 2:82  
               -( )- 2:79

B3/36      -] [- 2:32 2:33 2:34 2:79  
               -( )- 2:32

B3/37      -] [- 2:35 2:36 2:37 2:79

B3/37

-]/[- 2:86 2:87  
-( )- 2:35

B3/38

-] [- 2:38 2:39 2:40 2:79  
-]/[- 2:91 2:92  
-( )- 2:38

B3/39

-] [- 2:41 2:42 2:43 2:79  
-]/[- 2:96 2:97  
-( )- 2:41

B3/52

-] [- 2:33 2:34  
-]/[- 2:79  
-( )- 2:33

B3/53

-] [- 2:36 2:37  
-]/[- 2:79  
-( )- 2:36

B3/54

-] [- 2:39 2:40  
-]/[- 2:79  
-( )- 2:39

B3/55

-] [- 2:42 2:43  
-]/[- 2:79  
-( )- 2:42

; 2:80

AAH-1003

AAH-1003 | Alarm  
Alarm | Ack

B3 B3

Alarm Condition  
B3

( )-----

18

-----] [-----]/[-----]

40 56

FAH-1000 | FAH-1000  
FAH-1000 | Alarm  
Alarm | Ack

B3 B3

-----] [-----]/[-----]

41 57

RAH-1004 | RAH-1004  
RAH-1004 | Alarm  
Alarm | Ack

B3 B3

-----] [-----]/[-----]

42 58

FAL-1003 | FAL-1003  
FAL-1003 | Alarm  
Alarm | Ack

B3 B3

-----] [-----]/[-----]

43 59

B3/18

-] [- 2:82  
-( )- 2:80

B3/40      -] [- 2:44 2:45 2:46 2:77 2:80  
              -( )- 2:44

B3/41      -] [- 2:47 2:48 2:49 2:80  
              -( )- 2:47

B3/42      -] [- 2:50 2:51 2:52 2:77 2:80  
              -( )- 2:50

B3/43      -] [- 2:53 2:54 2:55 2:80  
              -( )- 2:53

B3/56      -] [- 2:45 2:46  
              -]/[- 2:80  
              -( )- 2:45

B3/57      -] [- 2:48 2:49  
              -]/[- 2:80  
              -( )- 2:48

B3/58      -] [- 2:51 2:52  
              -]/[- 2:80  
              -( )- 2:51

B3/59      -] [- 2:54 2:55  
              -]/[- 2:80  
              -( )- 2:54

Rung 2:81

|          |          |                                 | Alarm Condition |
|----------|----------|---------------------------------|-----------------|
| LAH-1005 | LAH-1005 | Alarm                           | B3              |
| Alarm    |          | Ack                             | B3              |
| 44       | 60       |                                 | ( )-----24      |
| TAH-400  | TAH-400  | Alarm                           | Alarm Ack       |
| Alarm    |          | B3                              | B3              |
| 9        | 20       |                                 |                 |
| TAH-410  | TAH-410  | Alarm                           | Alarm Ack       |
| Alarm    |          | B3                              | B3              |
| 10       | 21       |                                 |                 |
| TAHH-400 | TAHH-400 | Alarm                           | Alarm Ack       |
| Alarm    |          | B3                              | B3              |
| 11       | 22       |                                 |                 |
| TAHH-410 | TAHH-410 | Alarm                           | Alarm Ack       |
| Alarm    |          | B3                              | B3              |
| 12       | 23       |                                 |                 |
| AH-1006  | AH-1006  | Alarm                           | Alarm Ack       |
| Alarm    |          | O:031                           | B3              |
| 10       | 62       |                                 |                 |
| B3/9     |          | -] [- 2:59 2:60 2:61 2:81       |                 |
|          |          | -(- )- 2:59                     |                 |
| B3/10    |          | -] [- 2:62 2:63 2:64 2:81       |                 |
|          |          | -(- )- 2:62                     |                 |
| B3/11    |          | -] [- 2:65 2:66 2:67 2:77 2:81  |                 |
|          |          | -(- )- 2:65                     |                 |
| B3/12    |          | -] [- 2:68 2:69 -2:70 2:77 2:81 |                 |
|          |          | -(- )- 2:68                     |                 |
| B3/20    |          | -] [- 2:60 2:61                 |                 |
|          |          | -]/[- 2:81                      |                 |
|          |          | -(- )- 2:60                     |                 |
| B3/21    |          | -] [- 2:63 2:64                 |                 |
|          |          | -]/[- 2:81                      |                 |
|          |          | -(- )- 2:63                     |                 |
| B3/22    |          | -] [- 2:66 2:67                 |                 |
|          |          | -]/[- 2:81                      |                 |

B3/22 -( )- 2:66  
B3/23 -] [- 2:69 2:70  
-]/[- 2:81  
-( )- 2:69  
B3/24 -] [- 2:82  
-( )- 2:81  
B3/44 -] [- 2:56 2:57 2:58 2:81  
-( )- 2:56  
B3/60 -] [- 2:57 2:58  
-]/[- 2:81  
-( )- 2:57  
B3/62 -] [- 2:75 2:76  
-]/[- 2:81  
-( )- 2:75  
O:031/10 -] [- 2:74 2:75 2:76 2:81  
-( )- 2:74

Rung 2:82

AA-1000  
Alarm  
Beacon &  
Horn  
O:012  
( )-----  
17

\alarm  
condition  
B3  
+---] [-----  
16  
| Alarm  
| Condition  
| B3  
+---] [-----  
17  
| Alarm  
| Condition  
| B3  
+---] [-----  
18  
| Alarm  
| Condition  
| B3  
+---] [-----  
24  
B3/16  
-] [- 2:82  
-( )- 2:78  
B3/17  
-] [- 2:82  
-( )- 2:79  
B3/18  
-] [- 2:82  
-( )- 2:80

B3/24

-] [- 2:82  
-( )- 2:81

O:012/17

-( )- 2:82

Rung 2:83

If the motor starter for B-300 does not energize within 5 seconds, signal an alarm condition

B-300  
Motor Coil  
O:002----]- [-----  
03

|                     |          |
|---------------------|----------|
| B-300               |          |
| Alarm               |          |
| Timer               |          |
| +TON-----+          |          |
| +TIMER ON DELAY     | --(EN)-- |
| Timer T4:3          |          |
| Time base 1.0--(DN) |          |
| Preset 5            |          |
| Accum 0             |          |
| +-----+             |          |

O:002/03

-] [- 2:83  
-( )- 2:121

T4:3

-TON- 2:83

T4:3.DN

-] [- 2:84

Rung 2:84

-300

ux contact

I:000

Alarm  
Reset

T4:3 I:031

|               |         |
|---------------|---------|
| MMI:          |         |
| B-300         |         |
| Alarm         |         |
| O:030         |         |
| -----] [----- | --( )-- |
| 07            | DN      |
| 13            |         |
| 00            |         |

MMI:

B-300

Alarm

O:030

----]- [-----

00

I:000/07

-] [- 2:85  
-]/[- 2:84

I:031/13

-]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
2:59 2:62 2:65 2:68 2:84 2.89 2:94 2:99

O:030/00

-] [- 2:84  
-]/[- 2:86 2:87  
-( )- 2:84

T4:3

-TON- 2:83

T4:3.DN

-] [- 2:84

Rung 2:85

```

B-300
Aux
contact
I:000
---] [-----07-----]
          07
I:000/07
  -] [- 2:85
  -]/[- 2:84
O:030/01
  -( )- 2:85

```

MMI:  
B-300 On  
O:030  
01

Rung 2:86

Puts B-300 into timed operation

```

MMI:
B-300
Timed
Cycle
I:030
---] [-----03-----]
          03
MMI:
B-300
Timed
Operation
O:030
---] [-----02-----]
          02

```

|              |           |          |            |                  |          |             |         |
|--------------|-----------|----------|------------|------------------|----------|-------------|---------|
| MMI:         | B-300 Off | MMI:     | B-300 Auto | System Shut-down | MMI:     | B-300 Alarm | TAH-300 |
| I:030        | I:030     | I:030    |            | B3               | O:030    | B3          |         |
| ---] [-----] | /[-----]  | /[-----] | /[-----]   | /[-----]         | /[-----] | /[-----]    | >       |
| 03           | 00        | 02       |            | 19               | 00       | 37          |         |

```

LSHH-120
Alarm
< B3
<---]/[-----(
< 34

```

MMI:  
B-300  
Timed  
Operation  
O:030

---] [-----02-----]

B3/19

```

  -]/[- 2:86 2:87 2:91 2:92 2:96 2.97 2:101 2:103 2:105 2:121 2:122
  2:123
  -( )- 2:77

```

B3/34

```

  -] [- 2:24 2:25 2:26 2:78
  -]/[- 2:86 2:87 2:91 2:92
  -( )- 2:24

```

B3/37

```

  -] [- 2:35 2:36 2:37 2:79
  -]/[- 2:86 2:87

```

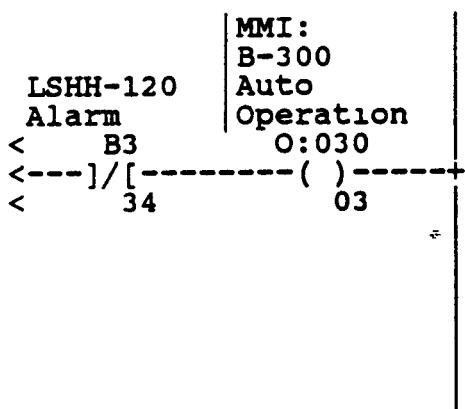
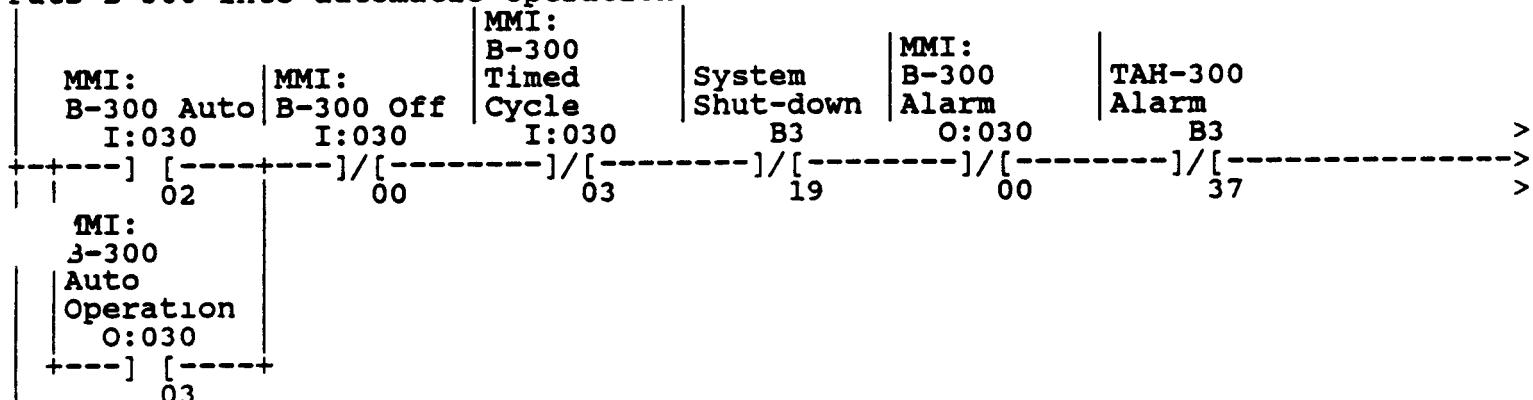
Program Listing Report

4 February 1994 Page 50  
PLC-5/15 File EGGVAP Rung 2.86

B3/37  
  -( )- 2:35  
I:030/00  
  -]/[- 2:86 2:87  
I:030/02  
  -] [- 2:87  
  -]/[- 2:86  
I:030/03  
  -] [- 2:86  
  -]/[- 2:87  
O:030/00  
  -] [- 2:84  
  -]/[- 2:86 2:87  
  -( )- 2:84  
O:030/02  
  -] [- 2:86 2:120  
  -( )- 2:86

Rung 2:87

Puts B-300 into automatic operation

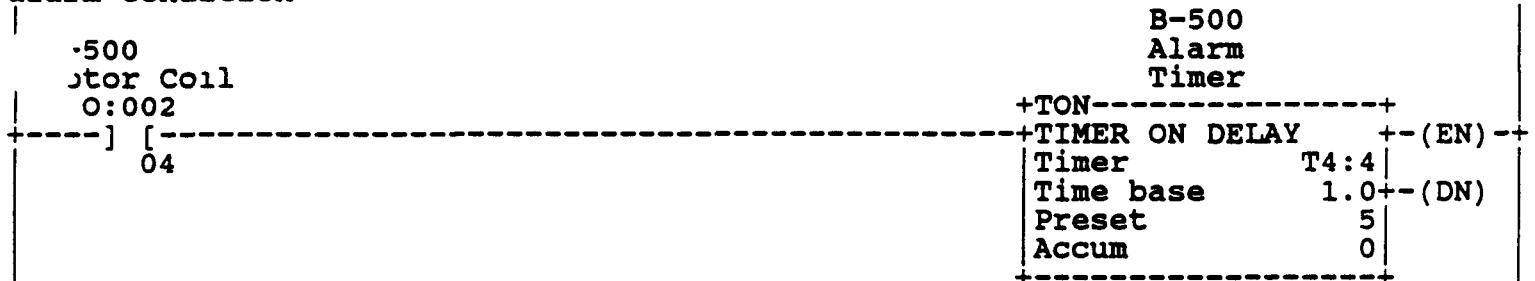


B3/19  
  -]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
  2:123  
  -( )- 2:77  
B3/34  
  -] [- 2:24 2:25 2:26 2:78

```
B3/34
  -]/[- 2:86 2:87 2:91 2:92
  -( )- 2:24
B3/37
  -] [- 2:35 2:36 2:37 2:79
  -]/[- 2:86 2:87
  -( )- 2:35
I:030/00
  -]/[- 2:86 2:87
I:030/02
  -] [- 2:87
  -]/[- 2:86
I:030/03
  -] [- 2:86
  -]/[- 2:87
O:030/00
  -] [- 2:84
  -]/[- 2:86 2:87
  -( )- 2:84
O:030/03
  -] [- 2:87 2:120
  -( )- 2:87
```

Rung 2:88

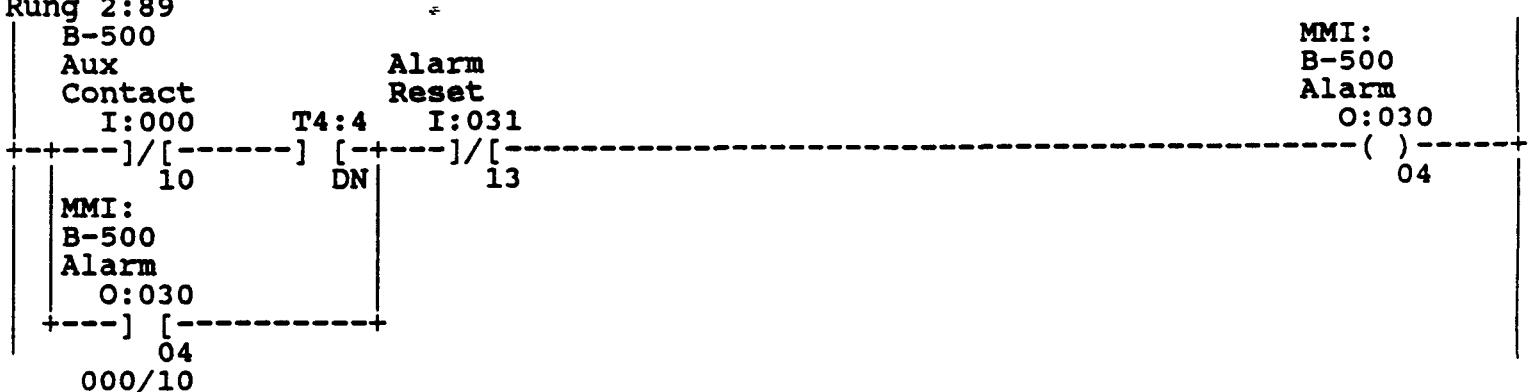
If the motor starter for B-500 does not energize within 5 seconds, signal an alarm condition



```
O:002/04
  -] [- 2:88
  -( )- 2:122
```

```
T4:4
  -TON- 2:88
T4:4.DN
  -] [- 2:89
```

Rung 2:89



I:000/10  
  -] [- 2:90  
  -]/[- 2:89  
I:031/13  
  -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56  
          2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99  
O:030/04  
  -] [- 2:89  
  -]/[- 2:91 2:92  
  -( )- 2:89  
T4:4  
  -TON- 2:88  
T4:4.DN  
  -] [- 2:89

Rung 2:90

B-500

Aux

Contact

I:000

-----] [-----

10

MMI:  
B-500 On  
O:030

( )-----

05

I:000/10

  -] [- 2:90  
  -]/[- 2:89

O:030/05

-( )- 2:90

2:91

, B-500 into timed operation

MMI:

B-500

Timed

Cycle

I:030

MMI:

B-500 Off

MMI:

B-500 Auto

MMI:

System

MMI:

B-500

Alarm

MMI:

TAH-500

Alarm

MMI:

B-500

B3

-----] [-----]/[-----]

07

04

06

19

04

38

&gt;

&gt;

MMI:

B-500

Timed

Operation

O:030

-----] [-----

06

&gt;

|               |           |
|---------------|-----------|
|               | MMI:      |
| LSHH-120      | B-500     |
| Alarm         | Timed     |
| < B3          | Operation |
| <----]/[----- | O:030     |
| < 34          | 06        |

B3/19

-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
2:123

-(- )- 2:77

B3/34

-] [- 2:24 2:25 2:26 2:78  
-]/[- 2:86 2:87 2:91 2:92  
-(- )- 2:24

B3/38

-] [- 2:38 2:39 2:40 2:79  
-]/[- 2:91 2:92  
-(- )- 2:38

I:030/04

-]/[- 2:91 2:92

I:030/06

-] [- 2:92  
-]/[- 2:91

I:030/07

-] [- 2:91  
-]/[- 2:92

O:030/04

-] [- 2:89  
-]/[- 2:91 2:92  
-(- )- 2:89

O:030/06

-] [- 2:91 2:120  
-(- )- 2:91

Rung 2:92

Puts B-500 into automatic operation

|                                    |       |                   |       |                     |       |                  |    |                     |       |               |    |  |
|------------------------------------|-------|-------------------|-------|---------------------|-------|------------------|----|---------------------|-------|---------------|----|--|
| MMI:<br>B-500 Auto                 | I:030 | MMI:<br>B-500 Off | I:030 | MMI:<br>Timed Cycle | I:030 | System Shut-down | B3 | MMI:<br>B-500 Alarm | O:030 | TAH-500 Alarm | B3 |  |
| 06                                 |       | 04                |       | 07                  |       | 19               |    | 04                  |       | 38            |    |  |
| >                                  |       |                   |       |                     |       |                  |    |                     |       |               |    |  |
| MMI:<br>B-500<br>Auto<br>Operation | O:030 |                   |       |                     |       |                  |    |                     |       |               |    |  |
| 07                                 |       |                   |       |                     |       |                  |    |                     |       |               |    |  |

|                        |       |                                    |       |
|------------------------|-------|------------------------------------|-------|
| LSHH-120               | Alarm | MMI:<br>B-500<br>Auto<br>Operation | O:030 |
| <                      | B3    | <                                  | 07    |
| <----]/[-----( )-----+ |       |                                    |       |
| <                      | 34    |                                    |       |

B3/19  
 -]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
 2:123  
 -( )- 2:77

B3/34  
 -] [- 2:24 2:25 2:26 2:78  
 -]/[- 2:86 2:87 2:91 2:92  
 -( )- 2:24

B3/38  
 -] [- 2:38 2:39 2:40 2:79  
 -]/[- 2:91 2:92  
 -( )- 2:38

I:030/04  
 -]/[- 2:91 2:92

I:030/06  
 -] [- 2:92  
 -]/[- 2:91

I:030/07  
 -] [- 2:91  
 -]/[- 2:92

O:030/04  
 -] [- 2:89  
 -]/[- 2:91 2:92

O:030/04  
-( )- 2:89  
O:030/07  
-] [- 2:92 2:120  
-( )- 2:92

Rung 2:93

If the motor starter for B-600 does not energize within 5 seconds, signal an alarm condition

B-600  
Motor Coil  
O:002  
----] [-----  
05

B-600  
Alarm  
Timer  
+TON-----+  
+TIMER ON DELAY +- (EN) --  
| Timer T4:5 |  
| Time base 1.0+- (DN) |  
| Preset 5 |  
| Accum 0 |  
-----+

O:002/05  
-] [- 2:93  
-( )- 2:123  
T4:5  
-TON- 2:93  
T4:5.DN  
-] [- 2:94

Rung 2:94

-600  
.ux  
Contact      Alarm  
I:000      T4:5      I:031  
----]/[-----] [-----]/[-----  
11            DN        13

MMI:  
B-600  
Alarm  
0.030  
----( )-----  
10

MMI:  
B-600  
Alarm  
O:030  
----] [-----  
10  
I:000/11  
-] [- 2:95  
-]/[- 2:94  
I:031/13  
-]/[- 2:18 2:21=2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2.56  
2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99  
O:030/10  
-] [- 2:94  
-]/[- 2:96 2:97  
-( )- 2:94  
T4:5  
-TON- 2:93  
T4:5.DN  
-] [- 2:94

Rung 2:95

```

| B-600
| Aux
| Contact
| I:000
+---] [-----]
|     11
| I:000/11
|     -] [- 2:95
|     -]/[- 2:94
O:030/11
-( )- 2:95

```

MMI:  
B-600 On  
O:030  
11

Rung 2:96

Puts B-600 into timed operation

```

MMI:          | MMI:          | MMI:          | System       | MMI:          | TAH-600
B-600          B-600 Off   B-600 Auto   Shut-down  B-600          Alarm
Timed          I:030      I:030      I:030      B3            O:030          B3
Cycle          |           |           |           |           |           |
+---] [-----]/[-----]/[-----]/[-----]/[-----]/[-----]>
|     13          10          12          19          10          39
| MMI:          | MMI:          | MMI:          | System       | MMI:          | TAH-600
B-600          B-600 Off   B-600 Auto   Shut-down  B-600          Alarm
Timed          I:030      I:030      I:030      B3            O:030          B3
Operation      |           |           |           |           |           |
O:030          |           |           |           |           |           |
---] [-----]
|     12

```

```

MMI:
B-600
Timed
Operation
O:030
---] [-----]
|     12

```

B3/19

```

-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122
2:123
-( )- 2:77

```

B3/39

```

-] [- 2:41 2:42 2:43 2:79
-]/[- 2:96 2:97
-( )- 2:41

```

I:030/10

```

-]/[- 2:96 2:97

```

-:030/12

```
I:030/12
  -] [- 2:97
  -]/[- 2:96
I:030/13
  -] [- 2:96
  -]/[- 2:97
O:030/10
  -] [- 2:94
  -]/[- 2:96 2:97
  -( )- 2:94
O:030/12
  -] [- 2:96 2:123
  -( )- 2:96
```

Rung 2:97

Puts B-600 into automatic operation

| MMI:<br>B-600 Auto | MMI:<br>B-600 Off | MMI:<br>Timed Cycle | System Shut-down | MMI:<br>B-600 Alarm | TAH-600<br>Alarm |
|--------------------|-------------------|---------------------|------------------|---------------------|------------------|
| I:030              | I:030             | I:030               | B3               | O:030               | B3               |
| --] [----+-----]   | [----+-----]      | [----+-----]        | [----+-----]     | [----+-----]        | [----+-----]     |
| 12                 | 10                | 13                  | 19               | 10                  | 39               |

> ----->

| MMI:<br>B-600<br>Auto<br>Operation |  |
|------------------------------------|--|
| O:030                              |  |
| --] [----+                         |  |
| 13                                 |  |

| MMI:<br>B-600<br>Auto<br>Operation |  |
|------------------------------------|--|
| < O:030                            |  |
| <----( )-----+                     |  |
| < 13                               |  |

B3/19

```
-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122
  2:123
  -( )- 2:77
```

B3/39

```
-] [- 2:41 2:42 2:43 2:79
  -]/[- 2:96 2:97
  -( )- 2:41
```

I:030/10

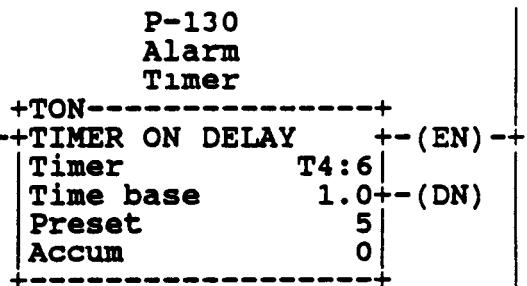
```
-]/[- 2:96 2:97
```

```
I:030/12
  -] [- 2:97
  -]/[- 2:96
I:030/13
  -] [- 2:96
  -]/[- 2:97
O:030/10
  -] [- 2:94
  -]/[- 2:96 2:97
  -( )- 2:94
O:030/13
  -] [- 2:97 2:123
  -( )- 2:97
```

Rung 2:98

If the motor starter for P-130 does not energize within 5 seconds, signal an alarm condition

```
P-130
Motor Coil
O:002
+---] [----- 02
```



```
002/02
  -] [- 2:98
  -( )- 2:126
```

```
T4:6
  -TON- 2:98
T4:6.DN
  -] [- 2:99
```

Rung 2:99

```
P-130
Aux Contact
  I:000      Alarm
  T4:6      Reset
+---]/[----- [---]/[----- 12 DN 13
MMI:
P-130
Alarm
O:030
+---] [----- 14
```

```
MMI:
P-130
Alarm
O:030
+---] [----- 14
```

```
I:000/12
  -] [- 2:100
  -]/[- 2:99
```

```
I:031/13
  -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56
  2:59 2:62 2:65 2:68 2:84 2:89 2:94 2:99
```

```
O:030/14
  -] [- 2:99
  -]/[- 2:101
```

## Program Listing Report

PLC-5/15

4 February 1994 Page 59  
File EGGVAP Rung 2:99O:030/14  
-( )- 2:99T4:6  
-TON- 2:98T4:6.DN  
-] [- 2:99

Rung 2:100

P-130

Aux

Contact

I:000

MMI:  
P-130 On  
O:030  
( )-----+  
15

-----]

12

I:000/12

-] [- 2:100  
-]/[- 2:99O:030/15  
-( )- 2:100

Rung 2:101

Puts P-130 into automatic operation

MMI:

P-130 Auto

I:030

MMI:

P-130 Off

I:030

System

B3

14

Shut-down

19

17

MMI:

P-130

0:030

14

Alarm

14

MMI:  
P-130  
Auto  
Operation  
O:030  
( )-----+  
16

MI:

P-130

Auto

Operation

O:030

-----]

16

B3/19

-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
2:123

-( )- 2:77

I:030/14

-]/[- 2:101 2:124

I:030/17

-] [- 2:101

O:030/14

-] [- 2:99

-]/[- 2:101

-( )- 2:99

O:030/16

-] [- 2:101 2:126

-( )- 2:101

Rung 2:102

Indication on MMI that P-2 is operating

P-2 CR

O:002

-----]

00

MMI:  
P-2 On  
O:031  
( )-----+  
00

O:002/00  
 -] [- 2:102  
 -( )- 2:128

O:031/00  
 -( )- 2:102

Rung 2:103

Puts P-2 into automatic operation

|                   |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
|-------------------|---------|-----------|-----------|------|------|-----------|-------|-------|-------|-------|-------|--|--|----------|------|--|--|----|----------|--|--|--|-----------|--|--|--|-------|--|--|--|-------|--|--|--|----|--|--|--|-------|--|--|--|-------|--|--|--|------------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|----------|-------|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|----------|-------|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--------|-------|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|
| MMI:              | MMI:    | System    | MMI:      |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| P-2 Auto          | P-2 Off | Shut-down | P-2 Auto  |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| I:031             | I:031   | B3        | -----     |      |      | Operation | 02    | 00    | 19    | O:031 | ----- |  |  | ( )----- | MMI: |  |  | 01 | P-2 Auto |  |  |  | Operation |  |  |  | O:031 |  |  |  | ----- |  |  |  | 01 |  |  |  | B3/19 |  |  |  | ----- |  |  |  | -]/[- 2:86 | 2:87 | 2:91 | 2:92 | 2:96 | 2:97 | 2:101 | 2:103 | 2:105 | 2:121 | 2:122 | 2:123 |  |  |  |  |  |  |  |  |  |  | -( )- 2:77 |  |  |  |  |  |  |  |  |  |  | I:031/00 | ----- |  |  |  |  |  |  |  |  |  | -]/[- 2:103 2:127 |  |  |  |  |  |  |  |  |  |  | I:031/02 | ----- |  |  |  |  |  |  |  |  |  | -] [- 2:103 |  |  |  |  |  |  |  |  |  |  | 031/01 | ----- |  |  |  |  |  |  |  |  |  | -] [- 2:103 2:128 |  |  |  |  |  |  |  |  |  |  | -( )- 2:103 |  |  |  |  |  |  |  |  |  |  |
| -----             |         |           | Operation |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| 02                | 00      | 19        | O:031     |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -----             |         |           | ( )-----  |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| MMI:              |         |           | 01        |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| P-2 Auto          |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| Operation         |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| O:031             |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -----             |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| 01                |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| B3/19             |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -----             |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -]/[- 2:86        | 2:87    | 2:91      | 2:92      | 2:96 | 2:97 | 2:101     | 2:103 | 2:105 | 2:121 | 2:122 |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| 2:123             |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -( )- 2:77        |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| I:031/00          | -----   |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -]/[- 2:103 2:127 |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| I:031/02          | -----   |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -] [- 2:103       |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| 031/01            | -----   |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -] [- 2:103 2:128 |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |
| -( )- 2:103       |         |           |           |      |      |           |       |       |       |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |       |  |  |  |       |  |  |  |            |      |      |      |      |      |       |       |       |       |       |       |  |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |          |       |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |        |       |  |  |  |  |  |  |  |  |  |                   |  |  |  |  |  |  |  |  |  |  |             |  |  |  |  |  |  |  |  |  |  |

Rung 2:104

Indication of MMI that P-3 is operating

|             |        |           |          |
|-------------|--------|-----------|----------|
| P-3 CR      | MMI:   | System    | MMI:     |
| O:002       | P-3 On | Shut-down | P-3 On   |
| -----       |        |           | O:031    |
| 01          | -----  |           | ( )----- |
| 0:002/01    | 03     |           |          |
| -----       |        |           |          |
| -] [- 2:104 |        |           |          |
| -( )- 2:130 |        |           |          |
| O:031/03    | -----  |           |          |
| -( )- 2:104 |        |           |          |

Rung 2:105

Puts P-3 into automatic operation

|           |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
|-----------|---------|-----------|-----------|--|--|-----------|----|----|----|-------|-------|--|--|----------|------|--|--|----|----------|--|--|--|-----------|--|--|--|-------|--|--|--|-------|--|--|--|----|--|--|--|
| MMI:      | MMI:    | System    | MMI:      |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| P-3 Auto  | P-3 Off | Shut-down | P-3 Auto  |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| I:031     | I:031   | B3        | -----     |  |  | Operation | 05 | 03 | 19 | O:031 | ----- |  |  | ( )----- | MMI: |  |  | 04 | P-3 Auto |  |  |  | Operation |  |  |  | O:031 |  |  |  | ----- |  |  |  | 04 |  |  |  |
| -----     |         |           | Operation |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| 05        | 03      | 19        | O:031     |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| -----     |         |           | ( )-----  |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| MMI:      |         |           | 04        |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| P-3 Auto  |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| Operation |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| O:031     |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| -----     |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |
| 04        |         |           |           |  |  |           |    |    |    |       |       |  |  |          |      |  |  |    |          |  |  |  |           |  |  |  |       |  |  |  |       |  |  |  |    |  |  |  |

B3/19

-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
2:123

-(- )- 2:77

I:031/03

-]/[- 2:105 2:129

I:031/05

-] [- 2:105

O:031/04

-] [- 2:105 2:130  
-(- )- 2:105

Rung 2:106

Timing logic for K-300

|               |
|---------------|
| +MOV-----+    |
| +MOVE-----+   |
| Source N7:76  |
| 50            |
| Dest T4:1.PRE |
| 50            |

N7:76

-MOV- 2:106

T4:1

-TON- 2:108

T4:1.PRE

-MOV- 2:106

2:107

|               |
|---------------|
| +MOV-----+    |
| +MOVE-----+   |
| Source N7:77  |
| 10            |
| Dest T4:2.PRE |
| 10            |

N7:77

-MOV- 2:107

T4:2

-TON- 2:109

T4:2.PRE

-MOV- 2:107

Rung 2:108

MMI: K-300

Reset

Timer

T4:2 I:031

DN 06

K-300 On  
Timer

|                            |
|----------------------------|
| +TON-----+                 |
| +TIMER ON DELAY +- (EN) -+ |
| Timer T4:1                 |
| Time base 1.0+- (DN)       |
| Preset 50                  |
| Accum 32                   |

I:031/06

-]/[- 2:108

T4:1

-TON- 2:108

```

14:1.ACC
    -MOV- 2:110
T4:1.DN
    -] [- 2:109 2:111
    -]/[- 2:110 2:112
T4:1.PRE
    -MOV- 2:106
T4:1.TT
    -] [- 2:120
T4:2
    -TON- 2:109
T4:2.DN
    -]/[- 2:108
Rung 2:109

```

Rung 2:109

T4:1

T4:1 -TON- 2:108  
T4:1.DN -] [- 2:109 2:111  
-]/[- 2:110 2:112  
T4:2 -TON- 2:109  
T4:2.ACC -MOV- 2:111  
T4:2.DN -]/[- 2:108  
T4:2.PRE -MOV- 2:107

Rung 2:110

T4:1

```
+--]/[-----  
DN  
  
N7:24      -MOV- 2:110  
T4:1       -TON- 2:108  
T4:1.ACC   -MOV- 2:110  
T4:1.DN    -1 [- 2:109
```

```

K-300 Off
Timer

+TON-----+
--+TIMER ON DELAY      +- (EN) --
| Timer          T4:2
| Time base      1.0+- (DN)
| Preset         10
| Accum          0
+-----+

```

| K-300           |
|-----------------|
| Timer           |
| Value           |
| +MOV-----+      |
| +MOVE +---      |
| Source T4:1.ACC |
| Dest N7:24      |

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PLC-5/15

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Rung 2:110

T4:1.DN  
-]/[- 2:110 2:112  
Rung 2:111

|                                     | K-300    |
|-------------------------------------|----------|
|                                     | Timer    |
|                                     | Value    |
| +MOV-----+<br>+MOVE-----+<br>Source | T4:2.ACC |
| 0                                   |          |
| Dest                                | N7:24    |
|                                     | 33       |

N7:24  
-MOV- 2:110 2:111  
T4:1  
-TON- 2:108  
T4:1.DN  
-] [- 2:109 2:111  
-]/[- 2:110 2:112  
T4:2  
-TON- 2:109  
T4:2.ACC  
-MOV- 2:111

Rung 2:112

| MMI: K-300 |
|------------|
| Timer      |
| Status     |
| O:031      |
| ( )        |
| 05         |

| T4:1  
+---]/[-----  
| DN  
| O:031/05  
| -( )- 2:112  
T4:1  
-TON- 2:108  
T4:1.DN  
-] [- 2:109 2:111  
-]/[- 2:110 2:112

Rung 2:113

Timing logic for K-600

| +MOV-----+<br>+MOVE-----+<br>Source | N7:78    |
|-------------------------------------|----------|
| 10                                  |          |
| Dest                                | T4:7.PRE |
|                                     | 10       |

N7:78  
-MOV- 2:113  
T4:7  
-TON- 2:115  
T4:7.PRE  
-MOV- 2:113

Rung 2:114

|               |
|---------------|
| +MOV-----+    |
| +MOVE-----+   |
| Source N7:79  |
| 20            |
| Dest T4:8.PRE |
| 20            |

N7:79

-MOV- 2:114

T4:8

-TON- 2:116

T4:8.PRE

-MOV- 2:114

Rung 2:115

MMI: K-600

Reset

Timer

T4:8 I:031

---]/[---]/[---

DN 07

|                            |
|----------------------------|
| K-600                      |
| On Timer                   |
| +TON-----+                 |
| +TIMER ON DELAY +- (EN) -- |
| Timer T4:7                 |
| Time base 1.0+- (DN)       |
| Preset 10                  |
| Accum 2                    |

I:031/07

---]/[--- 2:115

:7

-TON- 2:115

T4:7.ACC

-MOV- 2:117

T4:7.DN

---] [- 2:116 2:118

---] [- 2:117 2:119

T4:7.PRE

-MOV- 2:113

T4:7.TT

---] [- 2:123

T4:8

-TON- 2:116

T4:8.DN

---] [- 2:115

Rung 2:116

K-600  
Off Timer

|                            |
|----------------------------|
| +TON-----+                 |
| +TIMER ON DELAY +- (EN) -- |
| Timer T4:8                 |
| Time base 1.0+- (DN)       |
| Preset 20                  |
| Accum 0                    |

T4:7

-TON- 2:115

T4:7.DN

Program Listing Report

```

    -4:7.DN
        -] [- 2:116 2:118
        -]/[- 2:117 2:119
T4:8
    -TON- 2:116
T4:8.ACC
    -MOV- 2:118
T4:8.DN
    -]/[- 2:115
T4:8.PRE
    -MOV- 2:114

```

Rung 2:117

|             | K-600    |
|-------------|----------|
|             | Timer    |
|             | Value    |
| +MOV-----+  |          |
| +MOVE-----+ |          |
| Source      | T4:7.ACC |
|             | 2        |
| Dest        | N7:25    |
|             | 3        |

```

N7:25
    -MOV- 2:117 2:118
T4:7
    -TON- 2:115
T4:7.ACC
    -MOV- 2:117
-4:7.DN
    -] [- 2:116 2:118
    -]/[- 2:117 2:119

```

Rung 2:118

|             | K-600    |
|-------------|----------|
|             | Timer    |
|             | Value    |
| +MOV-----+  |          |
| +MOVE-----+ |          |
| Source      | T4:8.ACC |
|             | 0        |
| Dest        | N7:25    |
|             | 3        |

```

N7:25
    -MOV- 2:117 2:118
T4:7
    -TON- 2:115
T4:7.DN
    -] [- 2:116 2:118
    -]/[- 2:117 2:119
T4:8
    -TON- 2:116
T4:8.ACC
    -MOV- 2:118

```

Rung 2:119

```
T4:7
---]/[-----  
    DN
O:031/06
    -( )- 2:119
T4:7
    -TON- 2:115
T4:7.DN
    [-] [- 2:116 2:118
    ---]/[- 2:117 2:119
```

MMI: K-600  
Timer  
Status  
O:031  
 ( )-----+  
 06

Rung 2:120  
Operating logic for blowers B-300 & B-500

|           |           |
|-----------|-----------|
| MMI:      | MMI:      |
| B-300     | B-500     |
| Auto      | Auto      |
| Operation | Operation |
| O:030     | O:030     |
| -----]    | -----]    |
| 03        | 07        |
| MMI:      | MMI:      |
| B-300     | B-500     |
| Timed     | Timed     |
| Operation | Operation |
| O:030     | O:030     |
| -----]    | -----]    |
| 02        | 06        |
|           | T4:1      |
|           | TT        |

Blowers  
Operate  
B3  
 ( )-----+  
 3

B3/3  
 [-] [- 2:121 2:122  
 -( )- 2:120  
O:030/02  
 [-] [- 2:86 2:120  
 -( )- 2:86  
O:030/03  
 [-] [- 2:87 2:120  
 -( )- 2:87  
O:030/06  
 [-] [- 2:91 2:120  
 -( )- 2:91  
O:030/07  
 [-] [- 2:92 2:120  
 -( )- 2:92  
T4:1  
 -TON- 2:108  
T4:1.TT  
 [-] [- 2:120

Rung 2:121  
Operates B-300

|                                                                   |           |            |
|-------------------------------------------------------------------|-----------|------------|
| MMI:                                                              | System    | B-300      |
| B-300 On                                                          | Shut-down | Motor Coil |
| I:030                                                             | B3        | O:002      |
| -----] [-----]/[-----]                                            |           | ( )-----+  |
| 01                                                                | 19        | 03         |
| Blowers                                                           |           |            |
| Operate                                                           |           |            |
| B3                                                                |           |            |
| -----] [-----]                                                    |           |            |
| 3                                                                 |           |            |
| B3/3                                                              |           |            |
| -] [- 2:121 2:122                                                 |           |            |
| -( )- 2:120                                                       |           |            |
| B3/19                                                             |           |            |
| -]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122 |           |            |
| 2:123                                                             |           |            |
| -( )- 2:77                                                        |           |            |
| I:030/01                                                          |           |            |
| -] [- 2:121                                                       |           |            |
| O:002/03                                                          |           |            |
| -] [- 2:83                                                        |           |            |
| -( )- 2:121                                                       |           |            |
| MMI:                                                              | System    | B-500      |
| B-500 On                                                          | Shut-down | Motor Coil |
| I:030                                                             | B3        | O:002      |
| -----] [-----]/[-----]                                            |           | ( )-----+  |
| 05                                                                | 19        | 04         |
| Blowers                                                           |           |            |
| Operate                                                           |           |            |
| B3                                                                |           |            |
| -----] [-----]                                                    |           |            |
| 3                                                                 |           |            |
| B3/3                                                              |           |            |
| -] [- 2:121 2:122                                                 |           |            |
| -( )- 2:120                                                       |           |            |
| B3/19                                                             |           |            |
| -]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122 |           |            |
| 2:123                                                             |           |            |
| -( )- 2:77                                                        |           |            |
| I:030/05                                                          |           |            |
| -] [- 2:122                                                       |           |            |
| O:002/04                                                          |           |            |
| -] [- 2:88                                                        |           |            |
| -( )- 2:122                                                       |           |            |

Ru iq 2:123

## Operating logic for B-600

MMI: System  
B-600 On Shut-down  
1:030 B3

B-600  
Motor Coil  
0:002  
----( )----  
05

11  
MI:  
3-600  
Auto  
Operation  
0:030

13  
MI:  
3-600  
Timed  
Operation  
0:030

---] [-----] [--  
12 TT

B3/19

-]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122  
2:123

- ( ) - 2:77

I:030/i1

-] [- 2:123  
003/05

002/05  
-1

-] [- 2:93  
-( )- 2:123  
0/12

0:030/12  
1

-] [- 2:96 2:123  
= ( ) = 2:96

- ( ) - 2.90

-1

- ( ) - 2:97

— 1 —

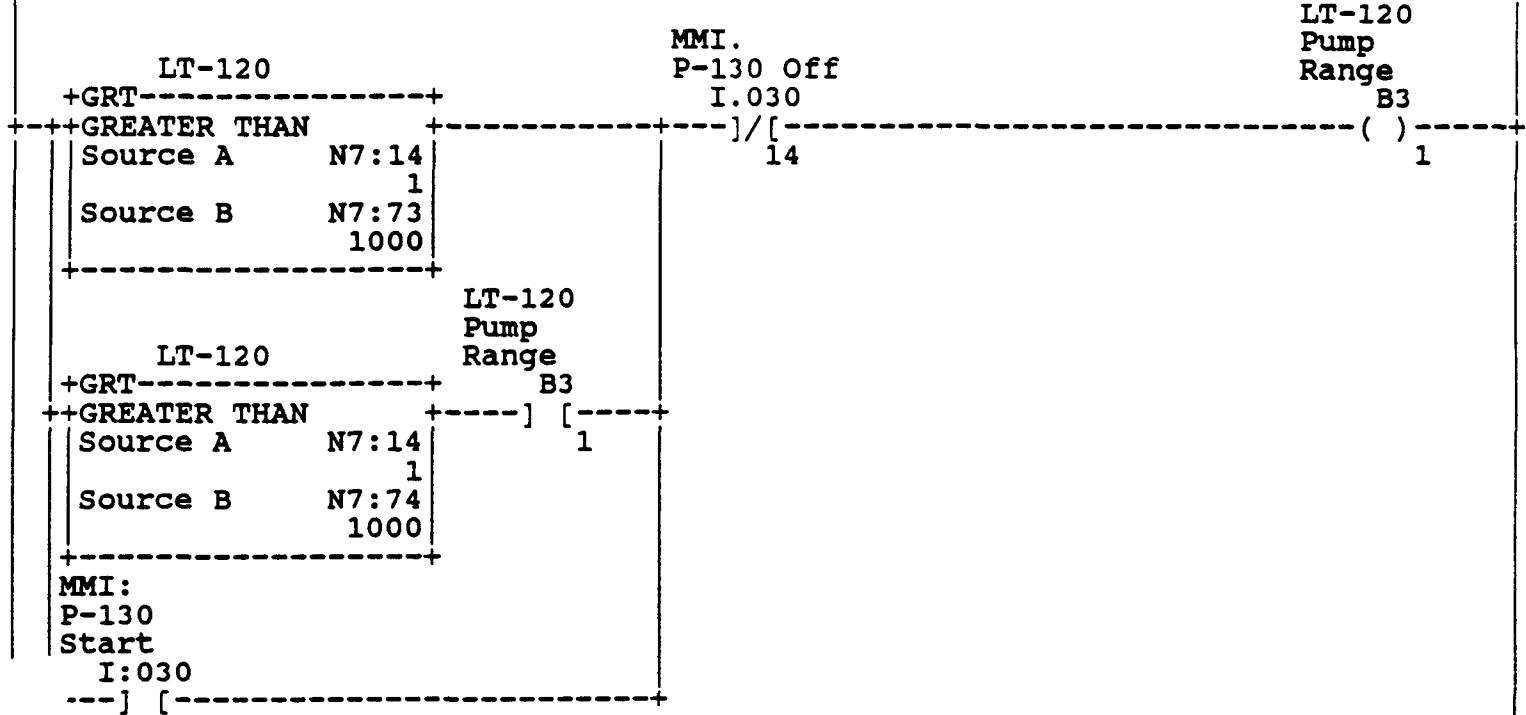
-TO

7. TT

-] [- 2:12]

Rung 2:124

Bit B3/1 is set when level in D-120 reaches LSH-120 set point and resets when level reaches LSL-120



B3/1

-] [- 2:124 2:126  
-( )- 2:124

I:030/14

-] / [- 2:101 2:124

I:030/16

-] [- 2:124

N7:14

-GRT- 2:24 2:124 2:124

N7:73

-GRT- 2:124

N7:74

-GRT- 2:124

Rung 2:125

High  
Level  
TK-2201/  
TK-2202

B3

8

LAH-2201 | LAH-22023

B3 B3

-] / [-----] / [-----

4 5

B3/4

-] [- 2:32  
-] / [- 2:125  
-( )- 2:31

B3/5



Rung 2:127

Set output if well level for P-2 is in operating range

SV1

Water

Level

MMI:

P-2 Off

I:031

P-2

Run

B3

6

| +GRT-----+<br>++GREATER THAN |              |
|------------------------------|--------------|
| Source A                     | N7:46<br>400 |
| Source B                     | N7:89<br>150 |

00

SV1

Water

Level

P-2

Run

B3

| +GRT-----+<br>++GREATER THAN |              |
|------------------------------|--------------|
| Source A                     | N7:46<br>400 |
| Source B                     | N7:88<br>100 |

P-2  
Start

I:031

14

/6

-] [- 2:127 2:128  
-( )- 2:127

I:031/00

-]/[- 2:103 2:127

I:031/14

-] [- 2:127

N7:46

-GRT- 2:127 2:127  
-SUB- 2:142

N7:88

-GRT- 2:127

N7:89

-GRT- 2:127

Rung 2:128

Logic to operate P-2

MMI:

P-2 On

I:031

P-2 CR  
O:002

00

01

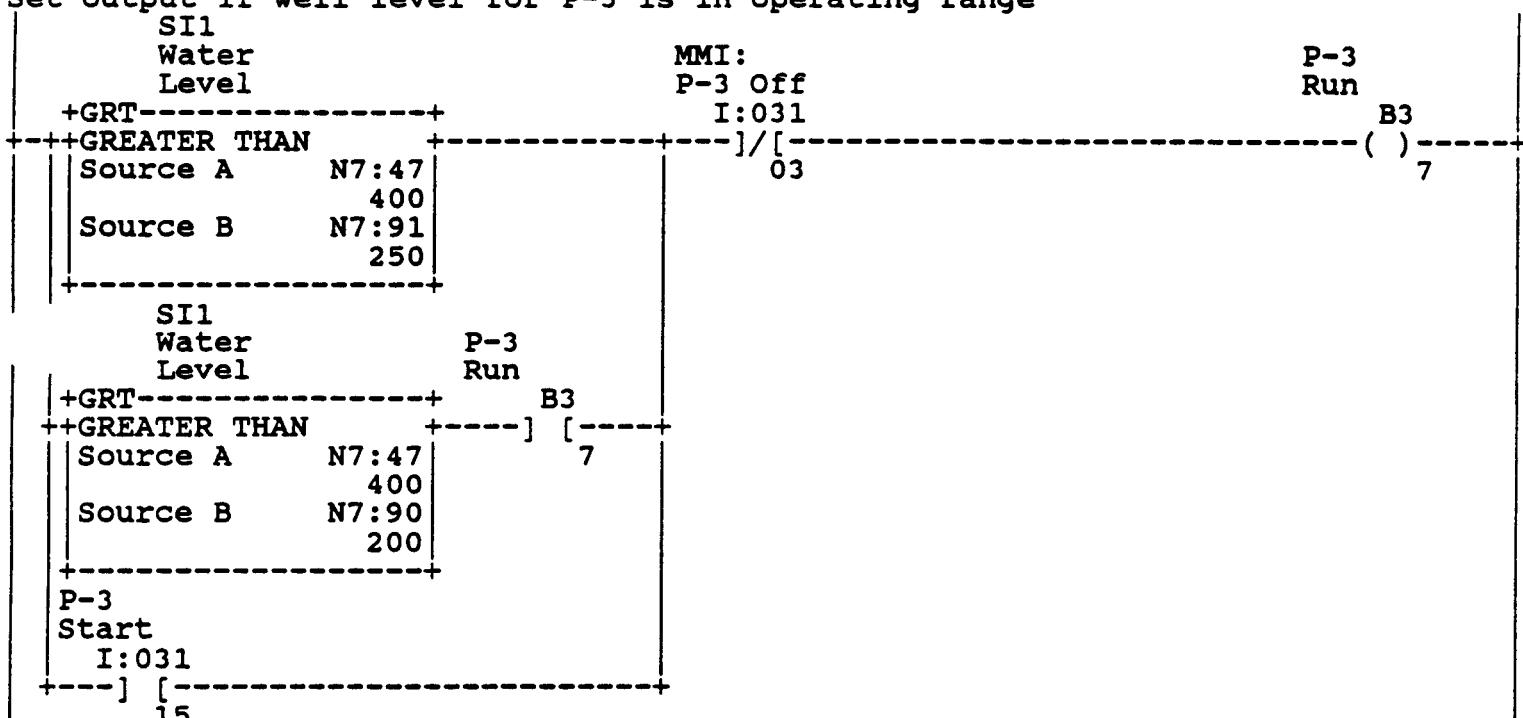
| MMI:                  | High<br>Level       | P-2<br>Run |
|-----------------------|---------------------|------------|
| P-2 Auto<br>Operation | TK-2201/<br>TK-2202 | B3         |
| O:031                 | B3                  | B3         |

'6

```

B3/6
  -] [- 2:127 2:128
  -( )- 2:127
B3/8
  -] [- 2:126 2:128 2:130
  -( )- 2:125
I:031/01
  -] [- 2:128
O:002/00
  -] [- 2:102
  -( )- 2:128
O:031/01
  -] [- 2:103 2:128
  -( )- 2:103
Rung 2:129
Set output if well level for P-3 is in operating range

```



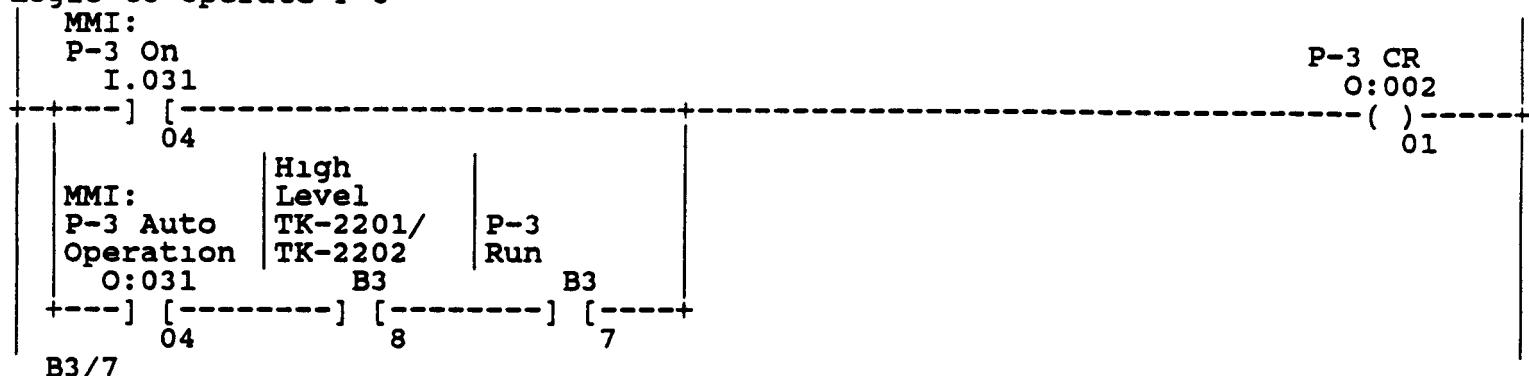
```

B3/7
  -] [- 2:129 2:130
  -( )- 2:129
I:031/03
  -]/[- 2:105 2:129
I:031/15
  -] [- 2:129
N7:47
  -GRT- 2:129 2:129
  -SUB- 2:143
N7:90
  -GRT- 2:129
N7:91
  -GRT- 2:129

```

Rung 2:130

Logic to operate P-3



B3/7

-] [- 2:129 2:130  
-( )- 2:129

B3/8

-] [- 2:126 2:128 2:130  
-( )- 2:125

I:031/04

-] [- 2:130

O:002/01

-] [- 2:104  
-( )- 2:130

O:031/04

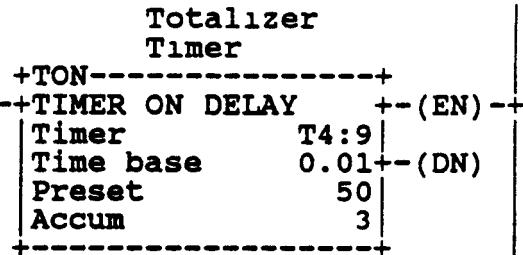
-] [- 2:105 2:130  
-( )- 2:105

Rung 2:131

Timer for totalizers

T4:9

DN



T4:9

-TON- 2:131

T4:9.DN

-] [- 2:132  
-]/[- 2:131

Rung 2:132

Add indication value to each of the totalizers when totalizer timer reaches timed value

T4:9

DN

FQ-100  
Holding

|                                       |              |
|---------------------------------------|--------------|
| +ADD-----+<br>++ADD-----+<br>Source A | N7:22<br>0   |
| Source B                              | N15:0<br>905 |
| Dest                                  | N15:0<br>905 |

FQ-500  
Holding

|                                       |              |
|---------------------------------------|--------------|
| +ADD-----+<br>++ADD-----+<br>Source A | N7:23<br>0   |
| Source B                              | N15:1<br>459 |
| Dest                                  | N15:1<br>459 |

FQ-110  
Holding

|                                       |              |
|---------------------------------------|--------------|
| +ADD-----+<br>++ADD-----+<br>Source A | N7:38<br>0   |
| Source B                              | N15:2<br>517 |
| Dest                                  | N15:2<br>517 |

N7:22  
-ADD- 2:132  
N7:23  
-ADD- 2:132  
N7:38  
-ADD- 2:132  
-FAL- 2:11  
N15:0  
-ADD- 2:132 2:132  
-GRT- 2:133  
-SUB- 2:133 2:133  
N15:1  
-ADD- 2:132 2:132  
-GRT- 2:136  
-SUB- 2:136 2:136  
N15:2  
-ADD- 2:132 2:132  
-GRT- 2:139  
-SUB- 2:139 2:139

## Program Listing Report

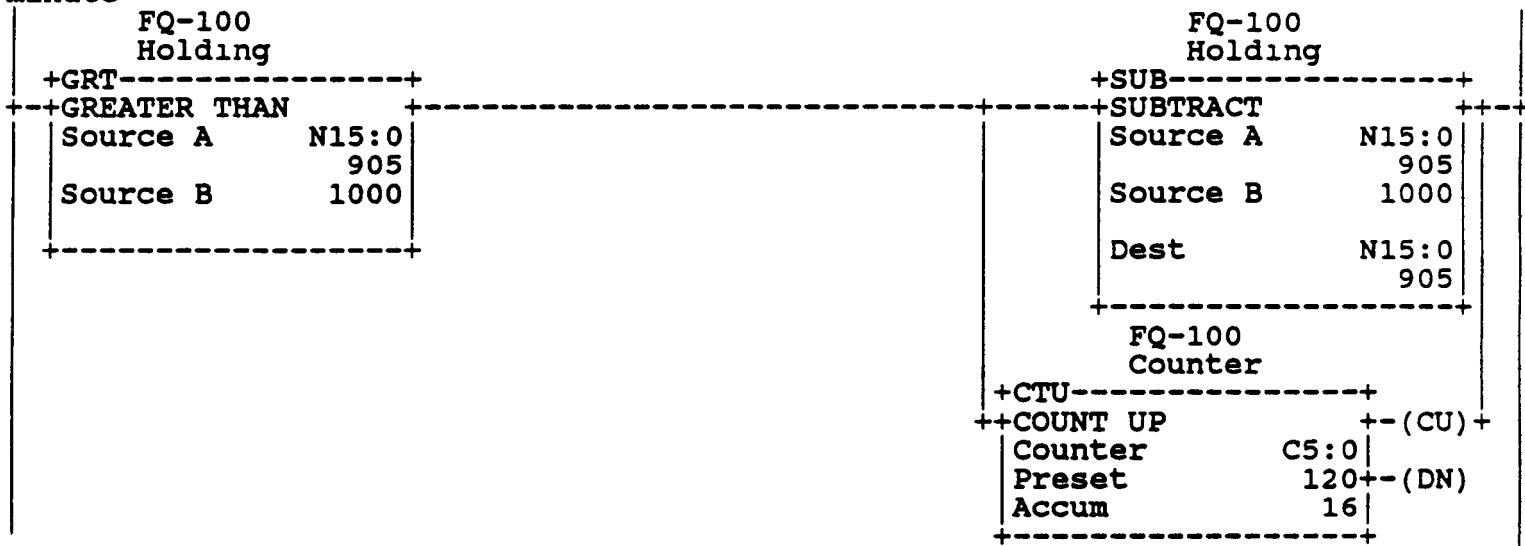
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 PLC-5/15 File EGGVAP Rung 2:132

I4:9  
 -TON- 2:131

T4:9.DN  
 -] [- 2:132  
 -]/[- 2:131

Rung 2:133

Increments FQ-100 when 1000 scf has flowed, corrected for 120 interations per minute



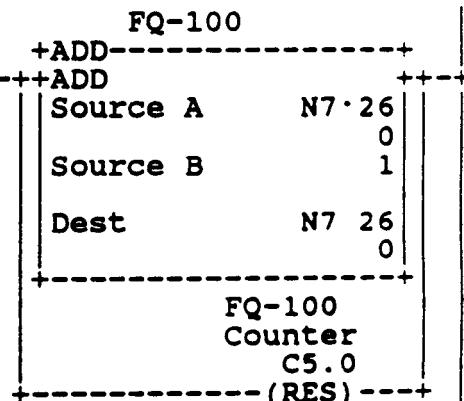
:0  
 -CTU- 2:133  
 -RES- 2:134

C5:0.DN  
 -] [- 2:134

N15:0  
 -ADD- 2:132 2:132  
 -GRT- 2:133  
 -SUB- 2:133 2:133

Rung 2:134

C5:0  
 ---] [-----  
 DN



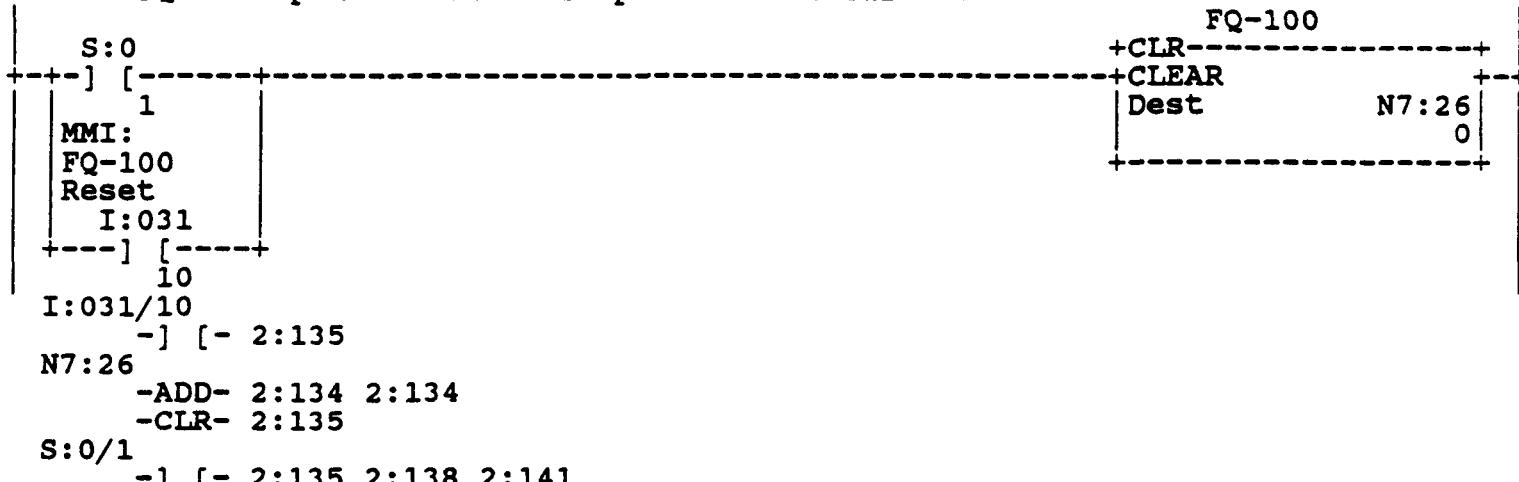
C5:0  
 -CTU- 2:133  
 -RES- 2:134

C5:0.DN  
-] [- 2:134

N7:26  
-ADD- 2:134 2:134  
-CLR- 2:135

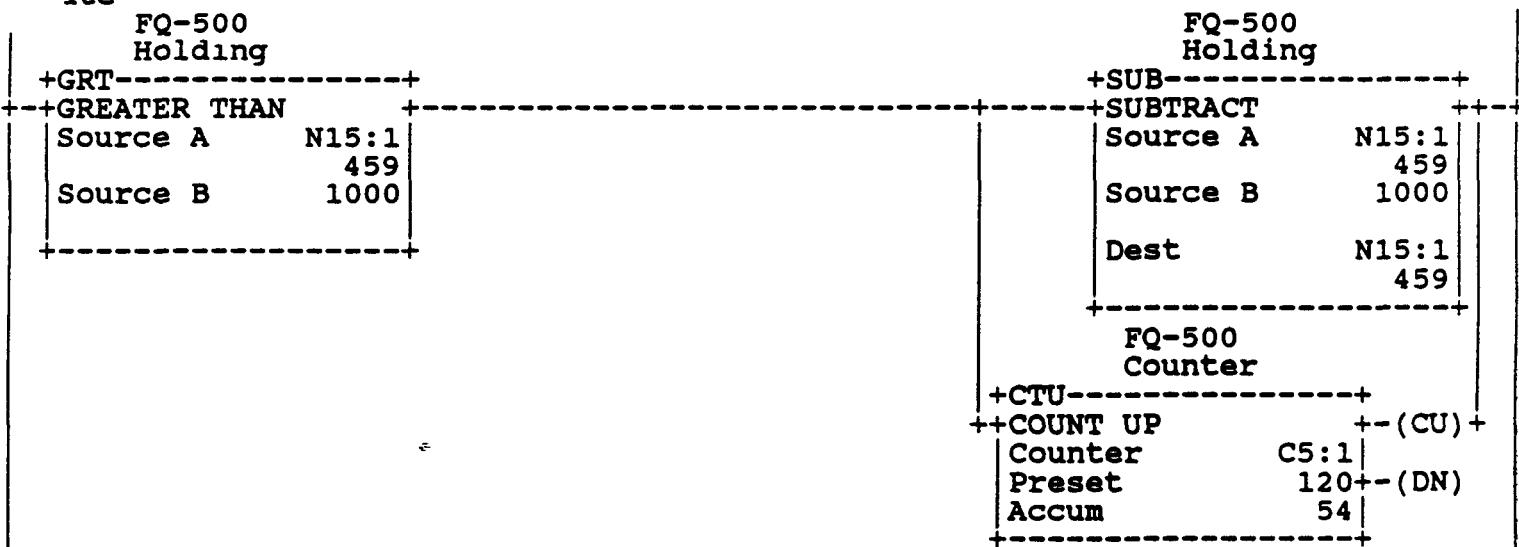
Rung 2:135

Resets FQ-100 upon overflow or operator initialized



Rung 2:136

increments FQ-500 when 1000 scf has flowed, corrected for 120 iterations per iteration

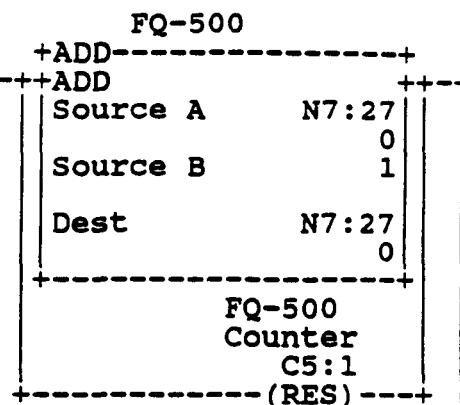


C5:1  
-CTU- 2:136  
-RES- 2:137

C5:1.DN  
-] [- 2:137

N15:1  
-ADD- 2:132 2:132  
-GRT- 2:136  
-SUB- 2:136 2:136

Rung 2:137

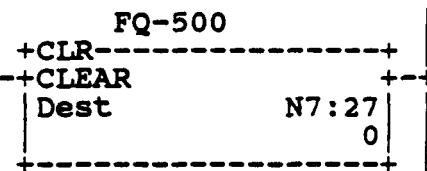
C5:1  
---] [-----  
DN

C5:1  
 -CTU- 2:136  
 -RES- 2:137  
 C5:1.DN  
 -] [- 2:137  
 N7:27  
 -ADD- 2:137 2:137  
 -CLR- 2:138

Rung 2:138

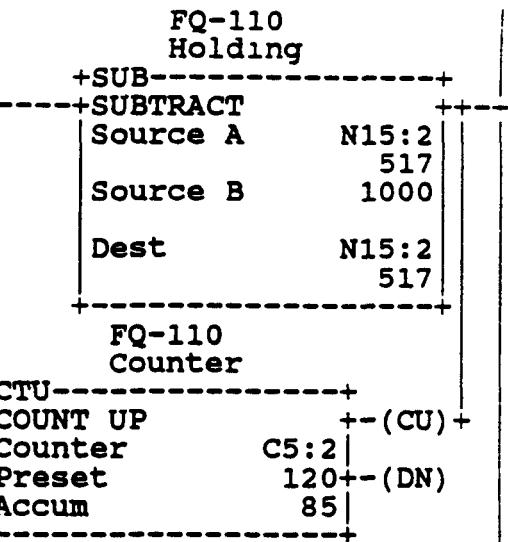
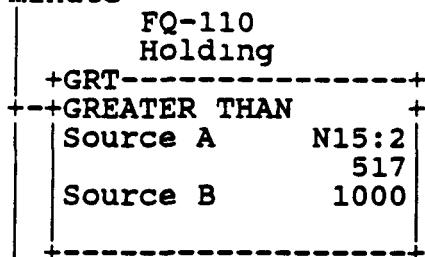
Resets FQ-500 upon overflow or operator initialized

S:0  
---] [-----  
1  
MMI:  
FQ-500  
Reset  
I:031  
+---] [----+  
12  
I:031/12  
-] [- 2:138  
N7:27  
-ADD- 2:137 2:137  
 -CLR- 2:138  
 S:0/1  
-] [- 2:135 2:138 2:141



Rung 2:139

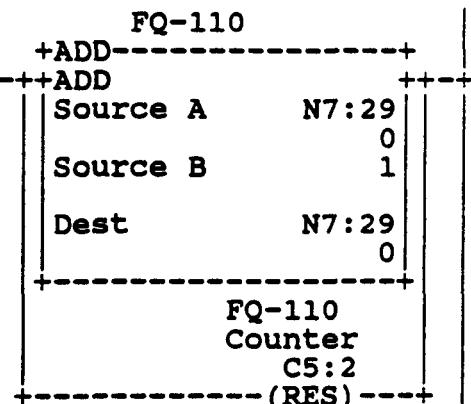
Increments FQ-110 when 1000 scf has flowed, corrected for 120 iterations per minute



C5:2  
 -CTU- 2:139  
 -RES- 2:140  
 C5:2.DN  
 -] [- 2:140  
 5:2  
 -ADD- 2:132 2:132  
 -GRT- 2:139  
 -SUB- 2:139 2:139

Rung 2:140

C5:2  
 ---] [-----  
 DN



C5:2  
 -CTU- 2:139  
 -RES- 2:140  
 C5:2.DN  
 -] [- 2:140  
 N7:29  
 -ADD- 2:140 2:140  
 -CLR- 2:141

Rung 2:141

Resets FQ-110 upon overflow or operator initialized

```

S:0
+---] [-----+
    1
MMI:
FQ-110
Reset
I:031
+---] [-----+
    11
I:031/11
    -] [- 2:141
N7:29
    -ADD- 2:140 2:140
    -CLR- 2:141
S:0/1
    -] [- 2:135 2:138 2:141

```

Rung 2:142

Subtract Bubbler Pressures for Well Water Depth

```

SV1
Water
Level
+SUB-----+
+SUBTRACT
| Source A      400
| Source B      N7:35
| Dest          N7:46
|               400
+-----+
N7:35
    -SUB- 2:142
N7:46
    -GRT- 2:127 2:127
    -SUB- 2:142

```

Rung 2:143

```

SI1
Water
Level
+SUB-----+
+SUBTRACT
| Source A      400
| Source B      N7:37
| Dest          N7:47
|               400
+-----+
N7:37
    -SUB- 2:143
N7:47
    -GRT- 2:129 2:129

```

ram Listing Report

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PLC-5/15 File EGGVAP Rung 2:143

N7:47

-SUB- 2:143

Rung 2:144

[END OF FILE]

NO MORE FILES

Allen-Bradley Company  
6200 Series Software  
PLC-5 Programming Terminal Software  
Release 4.3  
Cross Reference Report

Processor File: EGGVAP  
4 February 1994 - 13:56

REPORT OPTIONS

|                        |         |
|------------------------|---------|
| Page Width:            | 80      |
| Page Length:           | 66      |
| Graphics Capabilities: | NO      |
| Sort Order:            | Address |
| Address Comments:      | YES     |
| Mnemonics:             | YES     |
| Starting Type:         | A       |
| Ending Type:           | T       |

| Address | Symbol /<br>Instruction                                                                                 | Comment /<br>Program File Number:Rung Number |
|---------|---------------------------------------------------------------------------------------------------------|----------------------------------------------|
| B3/0    |                                                                                                         | Alarm Flashing Timer                         |
|         | -] [- 2:17 2:20 2:23 2:26 2:30 2:34 2:37 2:40 2:43 2:46 2:49 2:52 2:55<br>2:58 2:61 2:64 2:67 2:70 2:76 |                                              |
|         | -]/[- 2:17                                                                                              |                                              |
|         | -(- )- 2:17                                                                                             |                                              |
| B3/1    |                                                                                                         | LT-120 Pump Range                            |
|         | -] [- 2:124 2:126<br>-(- )- 2:124                                                                       |                                              |
| B3/3    |                                                                                                         | Blowers Operate                              |
|         | -] [- 2:121 2:122<br>-(- )- 2:120                                                                       |                                              |
| B3/4    |                                                                                                         | LAH-2201                                     |
|         | -] [- 2:32<br>-]/[- 2:125                                                                               |                                              |
|         | -(- )- 2:31                                                                                             |                                              |
| B3/5    |                                                                                                         | LAH-22023                                    |
|         | -] [- 2:28<br>-]/[- 2:125                                                                               |                                              |
|         | -(- )- 2:27                                                                                             |                                              |
| B3/6    |                                                                                                         | P-2 Run                                      |
|         | -] [- 2:127 2:128<br>-(- )- 2:127                                                                       |                                              |
| B3/7    |                                                                                                         | P-3 Run                                      |
|         | -] [- 2:129 2:130<br>-(- )- 2:129                                                                       |                                              |
| B3/8    |                                                                                                         | High Level TK-2201/ TK-2202                  |
|         | -] [- 2:126 2:128 2:130<br>-(- )- 2:125                                                                 |                                              |
| B3/9    |                                                                                                         | TAH-400 Alarm                                |
|         | -] [- 2:59 2:60 2:61 2:81<br>-(- )- 2:59                                                                |                                              |
| B3/10   |                                                                                                         | TAH-410 Alarm                                |
|         | -] [- 2:62 2:63 2:64 2:81<br>-(- )- 2:62                                                                |                                              |
| B3/11   |                                                                                                         | TAHH-400 Alarm                               |
|         | -] [- 2:65 2:66 2:67 2:77 2:81<br>-(- )- 2:65                                                           |                                              |
| B3/12   |                                                                                                         | TAHH-410 Alarm                               |
|         | -] [- 2:68 2:69 2:70 2:77 2:81<br>-(- )- 2:68                                                           |                                              |
| B3/16   |                                                                                                         | Alarm Condition                              |
|         | -] [- 2:82<br>-(- )- 2:78                                                                               |                                              |
| B3/17   |                                                                                                         | Alarm Condition                              |
|         | -] [- 2:82<br>-(- )- 2:79                                                                               |                                              |
| B3/18   |                                                                                                         | Alarm Condition                              |
|         | -] [- 2:82<br>-(- )- 2:80                                                                               |                                              |

| Address | Symbol / Instruction | Comment / Program File Number:Rung Number |
|---------|----------------------|-------------------------------------------|
|---------|----------------------|-------------------------------------------|

|       |                                                                   |                    |
|-------|-------------------------------------------------------------------|--------------------|
| B3/19 |                                                                   | System Shut-down   |
|       | -]/[- 2:86 2:87 2:91 2:92 2:96 2:97 2:101 2:103 2:105 2:121 2:122 | 2:123              |
|       | -(- )- 2:77                                                       |                    |
| B3/20 |                                                                   | TAH-400 Alarm Ack  |
|       | -] [- 2:60 2:61                                                   |                    |
|       | -]/[- 2:81                                                        |                    |
|       | -(- )- 2:60                                                       |                    |
| B3/21 |                                                                   | TAH-410 Alarm Ack  |
|       | -] [- 2:63 2:64                                                   |                    |
|       | -]/[- 2:81                                                        |                    |
|       | -(- )- 2:63                                                       |                    |
| B3/22 |                                                                   | TAHH-400 Alarm Ack |
|       | -] [- 2:66 2:67                                                   |                    |
|       | -]/[- 2:81                                                        |                    |
|       | -(- )- 2:66                                                       |                    |
| B3/23 |                                                                   | TAHH-410 Alarm Ack |
|       | -] [- 2:69 2:70                                                   |                    |
|       | -]/[- 2:81                                                        |                    |
|       | -(- )- 2:69                                                       |                    |
| B3/24 |                                                                   | Alarm Condition    |
|       | -] [- 2:82                                                        |                    |
|       | -(- )- 2:81                                                       |                    |
| 3/32  |                                                                   | AAL-1001 Alarm     |
|       | -] [- 2:18 2:19 2:20 2:77 2:78                                    |                    |
|       | -(- )- 2:18                                                       |                    |
| B3/33 |                                                                   | AAH-1002 Alarm     |
|       | -] [- 2:21 2:22 2:23 2:77 2:78                                    |                    |
|       | -(- )- 2:21                                                       |                    |
| B3/34 |                                                                   | LSHH-120 Alarm     |
|       | -] [- 2:24 2:25 2:26 2:78                                         |                    |
|       | -]/[- 2:86 2:87 2:91 2:92                                         |                    |
|       | -(- )- 2:24                                                       |                    |
| B3/35 |                                                                   | LAH-2202 Alarm     |
|       | -] [- 2:28 2:29 2:30 2:78                                         |                    |
|       | -(- )- 2:28                                                       |                    |
| B3/36 |                                                                   | LAH-2201 Alarm     |
|       | -] [- 2:32 2:33 2:34 2:79                                         |                    |
|       | -(- )- 2:32                                                       |                    |
| B3/37 |                                                                   | TAH-300 Alarm      |
|       | -] [- 2:35 2:36 2:37 2:79                                         |                    |
|       | -]/[- 2:86 2:87                                                   |                    |
|       | -(- )- 2:35                                                       |                    |
| B3/38 |                                                                   | TAH-500 Alarm      |
|       | -] [- 2:38 2:39 2:40 2:79                                         |                    |
|       | -]/[- 2:91 2:92                                                   |                    |
|       | -(- )- 2:38                                                       |                    |
| B3/39 |                                                                   | TAH-600 Alarm      |
|       | -] [- 2:41 2:42 2:43 2:79                                         |                    |
|       | -]/[- 2:96 2:97                                                   |                    |
|       | -(- )- 2:41                                                       |                    |

## C s Reference Report

PLC-5/15

| Address | Symbol /<br>Instruction        | Comment /<br>Program File Number:Rung Number |
|---------|--------------------------------|----------------------------------------------|
| B3/40   |                                | AHH-1003 Alarm                               |
|         | -] [- 2:44 2:45 2:46 2:77 2:80 |                                              |
|         | -(- )- 2:44                    |                                              |
| B3/41   |                                | FAH-1000 Alarm                               |
|         | -] [- 2:47 2:48 2:49 2:80      |                                              |
|         | -(- )- 2:47                    |                                              |
| B3/42   |                                | RAH-1004 Alarm                               |
|         | -] [- 2:50 2:51 2:52 2:77 2:80 |                                              |
|         | -(- )- 2:50                    |                                              |
| B3/43   |                                | FAL-1003 Alarm                               |
|         | -] [- 2:53 2:54 2:55 2:80      |                                              |
|         | -(- )- 2:53                    |                                              |
| B3/44   |                                | LAH-1005 Alarm                               |
|         | -] [- 2:56 2:57 2:58 2:81      |                                              |
|         | -(- )- 2:56                    |                                              |
| B3/48   |                                | AAL-1001 Alarm Ack                           |
|         | -] [- 2:19 2:20                |                                              |
|         | -]/[- 2:78                     |                                              |
|         | -(- )- 2:19                    |                                              |
| B3/49   |                                | AAH-1002 Alarm Ack                           |
|         | -] [- 2:22 2:23                |                                              |
|         | -]/[- 2:78                     |                                              |
|         | -(- )- 2:22                    |                                              |
| /50     |                                | LSHH-120 Alarm Ack                           |
|         | -] [- 2:25 2:26                |                                              |
|         | -]/[- 2:78                     |                                              |
|         | -(- )- 2:25                    |                                              |
| B3/51   |                                | LAH-2202 Alarm Ack                           |
|         | -] [- 2:29 2:30                |                                              |
|         | -]/[- 2:78                     |                                              |
|         | -(- )- 2:29                    |                                              |
| B3/52   |                                | LAH-2201 Alarm Ack                           |
|         | -] [- 2:33 2:34                |                                              |
|         | -]/[- 2:79                     |                                              |
|         | -(- )- 2:33                    |                                              |
| B3/53   |                                | TAH-300 Alarm Ack                            |
|         | -] [- 2:36 2:37                |                                              |
|         | -]/[- 2:79                     |                                              |
|         | -(- )- 2:36                    |                                              |
| B3/54   |                                | TAH-500 Alarm Ack                            |
|         | -] [- 2:39 2:40                |                                              |
|         | -]/[- 2:79                     |                                              |
|         | -(- )- 2:39                    |                                              |
| B3/55   |                                | TAH-600 Alarm Ack                            |
|         | -] [- 2:42 2:43                |                                              |
|         | -]/[- 2:79                     |                                              |
|         | -(- )- 2:42                    |                                              |
| B3/56   |                                | AAH-1003 Alarm Ack                           |
|         | -] [- 2:45 2:46                |                                              |
|         | -]/[- 2:80                     |                                              |
|         | -(- )- 2:45                    |                                              |

| Address  | Symbol /<br>Instruction                                                | Comment /<br>Program File Number:Rung Number |
|----------|------------------------------------------------------------------------|----------------------------------------------|
| B3/57    |                                                                        | FAH-1000 Alarm Ack                           |
|          | -] [- 2:48 2:49                                                        |                                              |
|          | -]/[- 2:80                                                             |                                              |
|          | -(-) - 2:48                                                            |                                              |
| B3/58    |                                                                        | RAH-1004 Alarm Ack                           |
|          | -] [- 2:51 2:52                                                        |                                              |
|          | -]/[- 2:80                                                             |                                              |
|          | -(-) - 2:51                                                            |                                              |
| B3/59    |                                                                        | FAL-1003 Alarm Ack                           |
|          | -] [- 2:54 2:55                                                        |                                              |
|          | -]/[- 2:80                                                             |                                              |
|          | -(-) - 2:54                                                            |                                              |
| B3/60    |                                                                        | LAH-1005 Alarm Ack                           |
|          | -] [- 2:57 2:58                                                        |                                              |
|          | -]/[- 2:81                                                             |                                              |
|          | -(-) - 2:57                                                            |                                              |
| B3/62    |                                                                        | AAH-1006 Alarm Ack                           |
|          | -] [- 2:75 2:76                                                        |                                              |
|          | -]/[- 2:81                                                             |                                              |
|          | -(-) - 2:75                                                            |                                              |
| C5:0     |                                                                        | FQ-100 Counter                               |
|          | -CTU- 2:133                                                            |                                              |
|          | -RES- 2:134                                                            |                                              |
| I:0.DN   |                                                                        |                                              |
|          | -] [- 2:134                                                            |                                              |
| C5:1     |                                                                        | FQ-500 Counter                               |
|          | -CTU- 2:136                                                            |                                              |
|          | -RES- 2:137                                                            |                                              |
| C5:1.DN  |                                                                        |                                              |
|          | -] [- 2:137                                                            |                                              |
| C5:2     |                                                                        | FQ-110 Counter                               |
|          | -CTU- 2:139                                                            |                                              |
|          | -RES- 2:140                                                            |                                              |
| C5:2.DN  |                                                                        |                                              |
|          | -] [- 2:140                                                            |                                              |
| I:000/00 |                                                                        | MCR                                          |
|          | -]/[- 2:77                                                             |                                              |
| I:000/01 |                                                                        | Alarm Ack                                    |
|          | -] [- 2:19 2:22 2:25 2:29 2:33 2:36 2:39 2:42 2:45 2:48 2:51 2:54 2:57 |                                              |
|          | 2:60 2:63 2:66 2:69 2:75                                               |                                              |
| I:000/02 |                                                                        | Alarm Test                                   |
|          | -] [- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56 |                                              |
|          | 2:59 2:62 2:65 2:68 2:74                                               |                                              |
| I:000/03 |                                                                        | FS-300                                       |
|          | -] [- 2:47                                                             |                                              |
| I:000/04 |                                                                        | FS-500                                       |
|          | -] [- 2:47                                                             |                                              |
| I:000/05 |                                                                        | FS-600                                       |
|          | -] [- 2:47                                                             |                                              |

| Address  | Symbol / Instruction | Comment / Program File Number:Rung Number |
|----------|----------------------|-------------------------------------------|
| I:000/06 |                      | RAH-1004                                  |
|          | -] [- 2:50           |                                           |
| I:000/07 | -] [- 2:85           | B-300 Aux contact                         |
|          | -]/[- 2:84           |                                           |
| I:000/10 |                      | B-500 Aux Contact                         |
|          | -] [- 2:90           |                                           |
|          | -]/[- 2:89           |                                           |
| I:000/11 |                      | B-600 Aux Contact                         |
|          | -] [- 2:95           |                                           |
|          | -]/[- 2:94           |                                           |
| I:000/12 |                      | P-130 Aux Contact                         |
|          | -] [- 2:100          |                                           |
|          | -]/[- 2:99           |                                           |
| I:000/13 |                      | FS-1003                                   |
|          | -] [- 2:53           |                                           |
| I:000/15 |                      | LS-1005                                   |
|          | -] [- 2:56           |                                           |
| I:030/00 |                      | MMI: B-300 Off                            |
|          | -]/[- 2:86 2:87      |                                           |
| I:030/01 |                      | MMI: B-300 On                             |
|          | -] [- 2:121          |                                           |
| T:030/02 |                      | MMI: B-300 Auto                           |
|          | -] [- 2:87           |                                           |
|          | -]/[- 2:86           |                                           |
| I:030/03 |                      | MMI: B-300 Timed Cycle                    |
|          | -] [- 2:86           |                                           |
|          | -]/[- 2:87           |                                           |
| I:030/04 |                      | MMI: B-500 Off                            |
|          | -]/[- 2:91 2:92      |                                           |
| I:030/05 |                      | MMI: B-500 On                             |
|          | -] [- 2:122          |                                           |
| I:030/06 |                      | MMI: B-500 Auto                           |
|          | -] [- 2:92           |                                           |
|          | -]/[- 2:91           |                                           |
| I:030/07 |                      | MMI: B-500 Timed Cycle                    |
|          | -] [- 2:91           |                                           |
|          | -]/[- 2:92           |                                           |
| I:030/10 |                      | MMI: B-600 Off                            |
|          | -]/[- 2:96 2:97      |                                           |
| I:030/11 |                      | MMI: B-600 On                             |
|          | -] [- 2:123          |                                           |
| I:030/12 |                      | MMI: B-600 Auto                           |
|          | -] [- 2:97           |                                           |
|          | -]/[- 2:96           |                                           |
| I:030/13 |                      | MMI: B-600 Timed Cycle                    |
|          | -] [- 2:96           |                                           |
|          | -]/[- 2:97           |                                           |
| I:030/14 |                      | MMI: P-130 Off                            |
|          | -]/[- 2:101 2:124    |                                           |

| Address  | Symbol / Instruction                                                   | Comment / Program File Number:Rung Number |
|----------|------------------------------------------------------------------------|-------------------------------------------|
| I:030/15 |                                                                        | MMI: P-130 On                             |
|          | -] [- 2:126                                                            |                                           |
| I:030/16 |                                                                        | MMI: P-130 Start                          |
|          | -] [- 2:124                                                            |                                           |
| I:030/17 |                                                                        | MMI: P-130 Auto                           |
|          | -] [- 2:101                                                            |                                           |
| I:031/00 |                                                                        | MMI: P-2 Off                              |
|          | -]/[- 2:103 2:127                                                      |                                           |
| I:031/01 |                                                                        | MMI: P-2 On                               |
|          | -] [- 2:128                                                            |                                           |
| I:031/02 |                                                                        | MMI: P-2 Auto                             |
|          | -] [- 2:103                                                            |                                           |
| I:031/03 |                                                                        | MMI: P-3 Off                              |
|          | -]/[- 2:105 2:129                                                      |                                           |
| I:031/04 |                                                                        | MMI: P-3 On                               |
|          | -] [- 2:130                                                            |                                           |
| I:031/05 |                                                                        | MMI: P-3 Auto                             |
|          | -] [- 2:105                                                            |                                           |
| I:031/06 |                                                                        | MMI: K-300 Reset Timer                    |
|          | -]/[- 2:108                                                            |                                           |
| I:031/07 |                                                                        | MMI: K-600 Reset Timer                    |
|          | -]/[- 2:115                                                            |                                           |
| I:031/10 |                                                                        | MMI: FQ-100 Reset                         |
|          | -] [- 2:135                                                            |                                           |
| I:031/11 |                                                                        | MMI: FQ-110 Reset                         |
|          | -] [- 2:141                                                            |                                           |
| I:031/12 |                                                                        | MMI: FQ-500 Reset                         |
|          | -] [- 2:138                                                            |                                           |
| I:031/13 |                                                                        | Alarm Reset                               |
|          | -]/[- 2:18 2:21 2:24 2:28 2:32 2:35 2:38 2:41 2:44 2:47 2:50 2:53 2:56 |                                           |
|          | 2:59 2:62 2:65 2:68 2:84 2.89 2:94 2:99                                |                                           |
| I:031/14 |                                                                        | P-2 Start                                 |
|          | -] [- 2:127                                                            |                                           |
| I:031/15 |                                                                        | P-3 Start                                 |
|          | -] [- 2:129                                                            |                                           |
| I:031/16 |                                                                        | FID Select Ext Vapor                      |
|          | -] [- 2:71                                                             |                                           |
| I:031/17 |                                                                        | FID Select GAC Feed                       |
|          | -] [- 2:72                                                             |                                           |
| I:032/00 |                                                                        | FID Alarm Reset                           |
|          | -]/[- 2:73 2:74                                                        |                                           |
| N7:0     |                                                                        | LT-2201                                   |
|          | -BTW- 2:12                                                             |                                           |
|          | -FAL- 2:8                                                              |                                           |
|          | -GRT- 2:31 2:32                                                        |                                           |
| N7:2     |                                                                        | LT-2203                                   |
|          | -GRT- 2:27 2:28                                                        |                                           |
| N7:11    |                                                                        | TT-500                                    |
|          | -GRT- 2:38                                                             |                                           |

| Address | Symbol /<br>Instruction | Comment /<br>Program File Number:Rung Number |
|---------|-------------------------|----------------------------------------------|
| N7:13   |                         | TT-600                                       |
|         | -GRT- 2:41              |                                              |
| N7:14   |                         | LT-120                                       |
|         | -GRT- 2:24 2:124        | 2:124                                        |
| N7:15   |                         | AE-1003                                      |
|         | -GRT- 2:44              |                                              |
| N7:16   |                         | TE-100                                       |
|         | -FAL- 2:9               |                                              |
| N7:20   |                         | TT-300                                       |
|         | -GRT- 2:35              |                                              |
| N7:22   |                         | FT-100                                       |
|         | -ADD- 2:132             |                                              |
| N7:23   |                         | FT-500                                       |
|         | -ADD- 2:132             |                                              |
| N7:24   |                         | K-300 Timer Value                            |
|         | -MOV- 2:110 2:111       |                                              |
| N7:25   |                         | K-600 Timer Value                            |
|         | -MOV- 2:117 2:118       |                                              |
| N7:26   |                         | FQ-100                                       |
|         | -ADD- 2:134 2:134       |                                              |
|         | -CLR- 2:135             |                                              |
| N7:27   |                         | FQ-500                                       |
|         | -ADD- 2:137 2:137       |                                              |
|         | -CLR- 2:138             |                                              |
| :29     |                         | FQ-110                                       |
|         | -ADD- 2:140 2:140       |                                              |
|         | -CLR- 2:141             |                                              |
| N7:30   |                         | AE-1001                                      |
|         | -FAL- 2:10              |                                              |
|         | -GRT- 2:18              |                                              |
| N7:31   |                         | AE-1002                                      |
|         | -GRT- 2:21              |                                              |
| N7:35   |                         | DP-2B                                        |
|         | -SUB- 2:142             |                                              |
| N7:37   |                         | DP-3B                                        |
|         | -SUB- 2:143             |                                              |
| N7:38   |                         | FT-110                                       |
|         | -ADD- 2:132             |                                              |
|         | -FAL- 2:11              |                                              |
| N7:39   |                         | FID                                          |
|         | -GRT- 2:73 2:73         | 2:74 2:74                                    |
| N7:40   |                         | TT-400A                                      |
|         | -GRT- 2:59 2:65         |                                              |
| N7:41   |                         | TT-400B                                      |
|         | -GRT- 2:59 2:65         |                                              |
| N7:42   |                         | TT-400C                                      |
|         | -GRT- 2:59 2:65         |                                              |
| N7:43   |                         | TT-410A                                      |
|         | -GRT- 2:62 2:68         |                                              |

| Address | Symbol / Instruction                   | Comment / Program File Number:Rung Number |
|---------|----------------------------------------|-------------------------------------------|
| N7:44   | -GRT- 2:62 2:68                        | TT-410B                                   |
| N7:45   | -GRT- 2:62 2:68                        | TT-410C                                   |
| N7:46   | -GRT- 2:127 2:127<br>-SUB- 2:142       | SV1 Water Level                           |
| N7:47   | -GRT- 2:129 2:129<br>-SUB- 2:143       | SI1 Water Level                           |
| N7:64   | -FAL- 2:15<br>-GRT- 2:18               | AAL-1001 Set Point                        |
| N7:65   | -GRT- 2:21                             | AAH-1002 Set Point                        |
| N7:66   | -GRT- 2:24                             | LSHH-120 Set Point                        |
| N7:67   | -GRT- 2:32                             | LAH-2201 Set Point                        |
| N7:68   | -GRT- 2:31                             | LAHH-2201 Set Point                       |
| N7:69   | -GRT- 2:35                             | TAH-300 Set Point                         |
| 7:70    | -GRT- 2:38                             | TAH-500 Set Point                         |
| ..7:71  | -GRT- 2:41                             | TAH-600 Set Point                         |
| N7:72   | -GRT- 2:44                             | AAH-1003 Set Point                        |
| N7:73   | -GRT- 2:124                            | LSH-120 Set Point                         |
| N7:74   | -GRT- 2:124                            | LSL-120 Set Point                         |
| N7:76   | -MOV- 2:106                            | K-300 On Set Point                        |
| N7:77   | -MOV- 2:107                            | K-300 Off Set Point                       |
| N7:78   | -MOV- 2:113                            | K-600 On Set Point                        |
| N7:79   | -MOV- 2:114                            | K-600 Off Set Point                       |
| N7:80   | -GRT- 2:28                             | LAH-2202 Set Point                        |
| N7:81   | -GRT- 2:27                             | LAHH-2202 Set Point                       |
| N7:82   | -GRT- 2:59 2:59                        | TAH-GAC Set Point                         |
| N7:83   | 2:59 2:62 2:62 2:62<br>-GRT- 2:65 2:65 | TAHH-GAC Set Point                        |
|         | 2:65 2:68 2:68 2:68                    |                                           |

| Address  | Symbol / Instruction | Comment / Program File Number:Rung Number |
|----------|----------------------|-------------------------------------------|
| N7:84    | -GRT- 2:74           | AAH-1006A Set Point                       |
| N7:85    | -GRT- 2:73           | AAHH-1006B Set Point                      |
| N7:86    | -GRT- 2:74           | AAH-1006B Set Point                       |
| N7:87    | -GRT- 2:73           | AAHH-1006B Set Point                      |
| N7:88    | -GRT- 2:127          | SV1 Low Set Point                         |
| N7:89    | -GRT- 2:127          | SV1 High Set Point                        |
| N7:90    | -GRT- 2:129          | SI1 Low Set Point                         |
| N7:91    | -GRT- 2:129          | SI1 High Set Point                        |
| N9:0     | -BTW- 2:1            |                                           |
| N9:37    | -BTW- 2:5            |                                           |
| N9:56    | -BTW- 2:3            |                                           |
| N9:93    | -BTW- 2:7            |                                           |
| 0:0      | -BTR- 2:0            |                                           |
| N10:0/0  | -] [- 2:1            |                                           |
| N10:4    | -FAL- 2:8            |                                           |
| N10:20   | -BTR- 2:4            |                                           |
| N10:20/0 | -] [- 2:5            |                                           |
| N10:24   | -FAL- 2:9            |                                           |
| N10:32   | -BTR- 2:2            |                                           |
| N10:32/0 | -] [- 2:3            |                                           |
| N10:36   | -FAL- 2:10           |                                           |
| N10:52   | -BTR- 2:6            |                                           |
| N10:52/0 | -] [- 2:7            |                                           |
| N10:56   | -FAL- 2:11           |                                           |
| N12:0    | -BTR- 2:0            |                                           |

| Address   | Symbol /<br>Instruction | Comment /<br>Program File Number:Rung Number |
|-----------|-------------------------|----------------------------------------------|
| N12:0/13  | -]/[- 2:8               |                                              |
| N12:0/15  | -]/[- 2:0               |                                              |
| N12:5     | -BTW- 2:1               |                                              |
| N12:5/15  | -]/[- 2:1               |                                              |
| N12:10    | -BTR- 2:4               |                                              |
| N12:10/13 | -]/[- 2:9               |                                              |
| N12:10/15 | -]/[- 2:4               |                                              |
| N12:15    | -BTW- 2:5               |                                              |
| N12:15/15 | -]/[- 2:5               |                                              |
| N12:20    | -BTR- 2:6               |                                              |
| N12:20/13 | -]/[- 2:11              |                                              |
| N12:20/15 | -]/[- 2:6               |                                              |
| 2:25      | -BTW- 2:7               |                                              |
| N12:25/15 | -]/[- 2:7               |                                              |
| N12:40    | -BTW- 2:12              |                                              |
| N12:40/15 | -]/[- 2:12              |                                              |
| N12:45    | -BTR- 2:13              |                                              |
|           | -BTW- 2:14              |                                              |
| N12:45/13 | -]/[- 2:15              |                                              |
| N12:45/15 | -]/[- 2:13              |                                              |
| N12:50    | -BTW- 2:3               | *                                            |
| N12:50/15 | -]/[- 2:3               |                                              |
| N12:55    | -BTR- 2:2               |                                              |
| N12:55/13 | -]/[- 2:10              |                                              |
| N12:55/15 | -]/[- 2:2               |                                              |

| Address   | Symbol /<br>Instruction                | Comment /<br>Program File Number:Rung Number |
|-----------|----------------------------------------|----------------------------------------------|
| N12:60/15 | -]/[- 2:14                             |                                              |
| N13:0     | -BTR- 2:13<br>-BTW- 2:14<br>-FAL- 2:15 |                                              |
| N15:0     |                                        | FQ-100 Holding                               |
|           | -ADD- 2:132 2:132                      |                                              |
|           | -GRT- 2:133                            |                                              |
|           | -SUB- 2:133 2:133                      |                                              |
| N15:1     |                                        | FQ-500 Holding                               |
|           | -ADD- 2:132 2:132                      |                                              |
|           | -GRT- 2:136                            |                                              |
|           | -SUB- 2:136 2:136                      |                                              |
| N15:2     |                                        | FQ-110 Holding                               |
|           | -ADD- 2:132 2:132                      |                                              |
|           | -GRT- 2:139                            |                                              |
|           | -SUB- 2:139 2:139                      |                                              |
| O:002/00  |                                        | P-2 CR                                       |
|           | -] [- 2:102                            |                                              |
|           | -(- )- 2:128                           |                                              |
| O:002/01  |                                        | P-3 CR                                       |
|           | -] [- 2:104                            |                                              |
|           | -(- )- 2:130                           |                                              |
| 002/02    |                                        | P-130 Motor Coil                             |
|           | -] [- 2:98                             |                                              |
|           | -(- )- 2:126                           |                                              |
| O:002/03  |                                        | B-300 Motor Coil                             |
|           | -] [- 2:83                             |                                              |
|           | -(- )- 2:121                           |                                              |
| O:002/04  |                                        | B-500 Motor Coil                             |
|           | -] [- 2:88                             |                                              |
|           | -(- )- 2:122                           |                                              |
| O:002/05  |                                        | B-600 Motor Coil                             |
|           | -] [- 2:93                             |                                              |
|           | -(- )- 2:123                           |                                              |
| O:012/00  |                                        | AAL-1001                                     |
|           | -(- )- 2:20                            |                                              |
| O:012/01  |                                        | AAH-1002                                     |
|           | -(- )- 2:23                            |                                              |
| O:012/02  |                                        | LSHH-120                                     |
|           | -(- )- 2:26                            |                                              |
| O:012/03  |                                        | LAH-2201                                     |
|           | -(- )- 2:34                            |                                              |
| O:012/04  |                                        | LAH-2202                                     |
|           | -(- )- 2:30                            |                                              |
| O:012/05  |                                        | TAH-300                                      |
|           | -(- )- 2:37                            |                                              |
| O:012/06  |                                        | TAH-500                                      |
|           | -(- )- 2:40                            |                                              |

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| Address  | Symbol / Instruction | Comment / Program File Number:Rung Number |
|----------|----------------------|-------------------------------------------|
| O:012/07 |                      | TAH-600                                   |
|          | -(-) - 2:43          |                                           |
| O:012/10 |                      | AAH-1003                                  |
|          | -(-) - 2:49          |                                           |
| O:012/11 |                      | FAH-1000                                  |
|          | -(-) - 2:46          |                                           |
| O:012/12 |                      | RAH-1004                                  |
|          | -(-) - 2:52          |                                           |
| O:012/13 |                      | FAL-1003                                  |
|          | -(-) - 2:55          |                                           |
| O:012/14 |                      | LAH-1005                                  |
|          | -(-) - 2:58          |                                           |
| O:012/15 |                      | AAH-1006                                  |
|          | -(-) - 2:76          |                                           |
| O:012/16 |                      | TAH-400                                   |
|          | -(-) - 2:61          |                                           |
| O:012/17 |                      | AA-1000 Alarm Beacon & Horn               |
|          | -(-) - 2:82          |                                           |
| O:013/00 |                      | TAH-410                                   |
|          | -(-) - 2:64          |                                           |
| O:013/01 |                      | TAHH-400                                  |
|          | -(-) - 2:67          |                                           |
| O:013/02 |                      | TAHH-410                                  |
|          | -(-) - 2:70          |                                           |
| 030/00   |                      | MMI: B-300 Alarm                          |
|          | -] [- 2:84           |                                           |
|          | -]/[- 2:86 2:87      |                                           |
|          | -(-) - 2:84          |                                           |
| O:030/01 |                      | MMI: B-300 On                             |
|          | -(-) - 2:85          |                                           |
| O:030/02 |                      | MMI: B-300 Timed Operation                |
|          | -] [- 2:86 2:120     |                                           |
|          | -(-) - 2:86          |                                           |
| O:030/03 |                      | MMI: B-300 Auto Operation                 |
|          | -] [- 2:87 2:120     |                                           |
|          | -(-) - 2:87          |                                           |
| O:030/04 |                      | MMI: B-500 Alarm                          |
|          | -] [- 2:89           |                                           |
|          | -]/[- 2:91 2:92      |                                           |
|          | -(-) - 2:89          |                                           |
| O:030/05 |                      | MMI: B-500 On                             |
|          | -(-) - 2:90          |                                           |
| O:030/06 |                      | MMI: B-500 Timed Operation                |
|          | -] [- 2:91 2:120     |                                           |
|          | -(-) - 2:91          |                                           |
| O:030/07 |                      | MMI: B-500 Auto Operation                 |
|          | -] [- 2:92 2:120     |                                           |
|          | -(-) - 2:92          |                                           |
| O:030/10 |                      | MMI: B-600 Alarm                          |
|          | -] [- 2:94           |                                           |
|          | -]/[- 2:96 2:97      |                                           |
|          | -(-) - 2:94          |                                           |

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| Address  | Symbol / Instruction      | Comment / Program File Number:Rung Number |
|----------|---------------------------|-------------------------------------------|
| O:030/11 | -(-) - 2:95               | MMI: B-600 On                             |
| O:030/12 | -] [- 2:96 2:123          | MMI: B-600 Timed Operation                |
|          | -(-) - 2:96               |                                           |
| O:030/13 | -] [- 2:97 2:123          | MMI: B-600 Auto Operation                 |
|          | -(-) - 2:97               |                                           |
| O:030/14 | -] [- 2:99                | MMI: P-130 Alarm                          |
|          | -]/[- 2:101               |                                           |
|          | -(-) - 2:99               |                                           |
| O:030/15 | -(-) - 2:100              | MMI: P-130 On                             |
| O:030/16 | -] [- 2:101 2:126         | MMI: P-130 Auto Operation                 |
|          | -(-) - 2:101              |                                           |
| O:031/00 | -(-) - 2:102              | MMI: P-2 On                               |
| O:031/01 | -] [- 2:103 2:128         | MMI: P-2 Auto Operation                   |
|          | -(-) - 2:103              |                                           |
| O:031/03 | -(-) - 2:104              | MMI: P-3 On                               |
| O:031/04 | -] [- 2:105 2:130         | MMI: P-3 Auto Operation                   |
|          | -(-) - 2:105              |                                           |
| O:031/05 | -(-) - 2:112              | MMI: K-300 Timer Status                   |
| O:031/06 | -(-) - 2:119              | MMI: K-600 Timer Status                   |
| O:031/07 | -] [- 2:73 2:74           | FID Select Ext Vapor                      |
|          | -]/[- 2:73 2:74           |                                           |
|          | -(-L) - 2:71              |                                           |
|          | -(-U) - 2:72              |                                           |
| O:031/10 | -] [- 2:74 2:75 2:76 2:81 | AAH-1006 Alarm                            |
|          | -(-) - 2:74               |                                           |
| O:031/11 | -] [- 2:73 2:74 2:77      | AAH-1006 Shut down                        |
|          | -(-) - 2:73               |                                           |
| R6:0     | -FAL- 2:15                |                                           |
| R6:1     | -FAL- 2:8                 |                                           |
| R6:2     | -FAL- 2:9                 |                                           |
| R6:3     | -FAL- 2:10                |                                           |

| Address  | Symbol / Instruction | Comment / Program File Number:Rung Number |
|----------|----------------------|-------------------------------------------|
| R6:4     | -FAL-                | 2:11                                      |
| S:0/1    | -] [-                | 2:135 2:138 2:141                         |
| S:7/3    | -] [-                | 2:14                                      |
|          | -]/[-                | 2:13                                      |
| T4:0     |                      | Alarm Flashing Timer                      |
|          | -TON-                | 2:16                                      |
| T4:0.DN  | -] [-                | 2:17                                      |
|          | -]/[-                | 2:16 2:17                                 |
| T4:1     |                      | K-300 On Timer                            |
|          | -TON-                | 2:108                                     |
| T4:1.ACC | -MOV-                | 2:110                                     |
| T4:1.DN  | -] [-                | 2:109 2:111                               |
|          | -]/[-                | 2:110 2:112                               |
| T4:1.PRE | -MOV-                | 2:106                                     |
| T4:1.TT  | -] [-                | 2:120                                     |
| -1:2     |                      | K-300 Off Timer                           |
|          | -TON-                | 2:109                                     |
| +2:2.ACC | -MOV-                | 2:111                                     |
| T4:2.DN  | -]/[-                | 2:108                                     |
| T4:2.PRE | -MOV-                | 2:107                                     |
| T4:3     |                      | B-300 Alarm Timer                         |
|          | -TON-                | 2:83                                      |
| T4:3.DN  | -] [-                | 2:84                                      |
| T4:4     |                      | B-500 Alarm Timer                         |
|          | -TON-                | 2:88                                      |
| T4:4.DN  | -] [-                | 2:89                                      |
| T4:5     |                      | B-600 Alarm Timer                         |
|          | -TON-                | 2:93                                      |
| T4:5.DN  | -] [-                | 2:94                                      |
| T4:6     |                      | P-130 Alarm Timer                         |
|          | -TON-                | 2:98                                      |
| T4:6.DN  | -] [-                | 2:99                                      |
| T4:7     |                      | K-600 On Timer                            |
|          | -TON-                | 2:115                                     |

| Address  | Symbol / Instruction                   | Comment / Program File Number:Rung Number |
|----------|----------------------------------------|-------------------------------------------|
| T4:7.ACC | -MOV- 2:117                            |                                           |
| T4:7.DN  | -] [- 2:116 2:118<br>-]/[- 2:117 2:119 |                                           |
| T4:7.PRE | -MOV- 2:113                            |                                           |
| T4:7.TT  | -] [- 2:123                            |                                           |
| T4:8     | -TON- 2:116                            | K-600 Off Timer                           |
| T4:8.ACC | -MOV- 2:118                            |                                           |
| T4:8.DN  | -]/[- 2:115                            |                                           |
| T4:8.PRE | -MOV- 2:114                            |                                           |
| T4:9     | -TON- 2:131                            | Totalizer Timer                           |
| T4:9.DN  | -] [- 2:132<br>-]/[- 2:131             |                                           |

+-----+  
Allen-Bradley Company  
6200 Series Software  
PLC-5 Programming Terminal Software  
Release 4.3  
Memory Map Report

Processor File: EGGVAP  
4 February 1994 - 13:51

REPORT OPTIONS

|                        |    |
|------------------------|----|
| Page Width:            | 80 |
| Page Length:           | 66 |
| Graphics Capabilities: | NO |

| FILE |   | TYPE           | LAST ADDRESS | SIZE (elements) | SIZE (words) |
|------|---|----------------|--------------|-----------------|--------------|
| 0    | O | output         | O:037        | 32              | 32           |
| 1    | I | input          | I:037        | 32              | 32           |
| 2    | S | status         | S:31         | 32              | 32           |
| 3    | B | binary or bit  | B3/63        | 4               | 4            |
| 4    | T | timer          | T4:9         | 10              | 30           |
| 5    | C | counter        | C5:2         | 3               | 9            |
| 6    | R | control        | R6:4         | 5               | 15           |
| 7    | N | integer        | N7:95        | 96              | 96           |
| 8    | F | floating point | F8:0         | 1               | 2            |
| 9    | N | integer        | N9:111       | 112             | 112          |
| 10   | N | integer        | N10:63       | 64              | 64           |
| 11   | N | integer        | N11:35       | 36              | 36           |
| 12   | N | integer        | N12:60       | 61              | 61           |
| 13   | N | integer        | N13:31       | 32              | 32           |
| 14   |   | unused         |              | 0               | 0            |
| 15   | N | integer        | N15:2        | 3               | 3            |
| 16   | N | integer        | N16:15       | 16              | 16           |

## PROCESSOR MEMORY LAYOUT

576 words of memory used in 17 data table files  
1131 words of memory used in 3 program files  
5158 words of unused memory available

**Index of Manufacturers Data  
Volume 1**

| <b>Tab</b> | <b>Item</b>                                  | <b>Manufacturer</b>              |
|------------|----------------------------------------------|----------------------------------|
| 1          | Trailer                                      | Great Dane                       |
| 2          | Knockout Drum, D-120                         | Penn Separators                  |
| 3          | HEPA Filter Housings, FL-200, FL-210, FL-220 | Barneby & Sutcliffe Corporation  |
| 4          | Vacuum Blowers                               | Sutorbilt                        |
| 5          | Activated Carbon Columns, D-400, D-410       | Carbonair Environmental Services |
| 6          | Knockout Drum Transfer Pump, P-130           | Goulds Pump                      |
| 7          | Gas Sampling Pump, P-700                     | KNF Neuberger                    |
| 8          | Outside Lights                               | Stonco                           |
| 9          | Air Conditioner                              | White Westinghouse               |
| 10         | Heaters                                      | Q Mark                           |
| 11         | 24 Volt Power Supplies                       | Deltron                          |
| 12         | Run Time Meters                              | Omron                            |
| 13         | Main Disconnect Switches                     | Cutler-Hammer                    |
| 14         | Control Panel Disconnect Switch              | Hoffman                          |

**Index of Manufacturers Data  
Volume 2**

| <b>Tab</b> | <b>Item</b>                   | <b>Manufacturer</b> |
|------------|-------------------------------|---------------------|
| 1          | Programmable Logic Controller | Allen-Bradley       |
| 2          | Annunciator Panel             | Ametek              |
| 3          | Graphic Interface Panel       | Eaton IDT           |

**Index of Manufacturers Data  
Volume 3**

| <b>Tab</b> | <b>Item</b>                                | <b>Manufacturer</b>     |
|------------|--------------------------------------------|-------------------------|
| 1          | Temperature/Relative Humidity Transmitters | Endress+Hauser          |
| 2          | Pressure Transmitters                      | Endress+Hauser          |
| 3          | Level Transmitters                         | Endress+Hauser          |
| 4          | Temperature Transmitters                   | Moore Industries        |
| 5          | Mass Flow Transmitters                     | Sierra Instruments, Inc |
| 6          | Leak Detection System                      | Raychem                 |
| 7          | Flow Switches                              | W E Anderson            |
| 8          | Differential Pressure Gauges               | Dwyer                   |
| 9          | Oxygen Transmitter/Detector                | Scott Aviation          |
| 10         | Combustible Gas Transmitter/Detector       | Scott Aviation          |
| 11         | Oxygen/Combustible Gas Alarm Unit          | Scott Aviation          |
| 12         | Alpha Air Monitor Sampling Pump            | SAIC                    |
| 13         | Alpha Air Monitor System                   | SAIC                    |
| 14         | Flame Ionization Detector                  | Eagle                   |
| 15         | Bubbler Panel                              | Baski                   |